Flight Surgeon's NEWSLETTER

(This material is for the information of Navy flight surgeons only and does not necessarily reflect endorsement by the Navy or the Naval Aviation Safety Center.)

A SHORT SURVEY OF BACK DISORDERS AND TREATMENT

The following article is reprinted from an American Airlines' publication, Flight Deck, October, 1964. The author is Dr, Andrew M, Campbell. Dr, Campbell is a graduate of Princeton University and Columbia University's College of Physicians and Surgeons. He is considered to be an expert on back disorders.

Dr. Campbell's article is reprinted here for possible use as squadron lecture material. In relation to this lecture topic, flight surgeons can emphasize to pilots and RIO's the necessity for proper positioning of the spine prior to ejection to prevent unnecessary injuries.

"It has been said that if you're going to dance you will have to pay the fiddler. Well, since man has assumed the erect posture, and has learned to dance, he has been paying the fiddler, and always for the same old tune, 'Oh, My Aching Back.'

"In order to understand what makes the back ache, we must first know a little about what makes up the spine. An extremely complex structure that gives support and mobility to the body, the spine consists of 28 bones joined together by firm, fibrous bands called ligaments, but separated from one another by cushions of cartilage called invertebral discs. Surrounding the bone structure are innumerable pairs of muscles; some as large and powerful as thigh muscles, others almost as small as the ones that move the eyes.

"The bones making up the spine are called vertebrae and consist of various parts. The central portion, or body, is the heavy block of bone which forms the supporting element. From this, various other structures arise. Extending backward at an angle from the sides of the body are two struts called pedicles. These join with similar shaped bones called the lamina, and together they form a bridge known as the neural arch. The neural arch encloses and protects the spinal cord. Projecting from the sides of the neural arch are two flat thick bones called the transverse processes, and projecting from the rear of the arch we find the spinous processes. These processes afford attachment for muscles, and also act as levers to transmit muscular force to the spine.

"Forming paired joints on either side of each vertebra are structures called facets. They consist of flat projections of bone extending from the upper and lower aspects of the sides of each vertebra. The surfaces of these projections

come into apposition, forming sliding joints. As we bend and turn, the surfaces of the facets glide in and out, and actually act as flanges to control the direction and extent of motion. They permit only a small arc for any one vertebra, but the summation of the arcs results in a considerable range of motion.

"Describing the spinal column by sections, the cervical area, or neck, consists of seven bones, light in structure and affording great mobility to the head. The thoracic part of the spine is made up of 12 bones, increasing in size from above downward. Paired ribs articulate with each of the thoracic vertebrae, and coursing around to the sternum, or breast bone, they form the chest. This is the least mobile portion of the spine, being limited by the rib cage.

"The lumbar area follows next. Made up of five large bones surrounded by heavy musculature, it is the work area of the back. However, despite the fact that the bones and muscles in this area are the strongest, it is actually the 'weak spot' and the seat of most back troubles.

"All the mobile portions of the spine rest on the sacrum, which forms part of the pelvic girdle as well as the spine. It develops from three separate bones which fuse into one solid segment. There is practically no mobility in this area despite the fact that it forms part of what is probably the most famous joint in the body, the sacroiliac.

"The last portion of the spine is the coccyx, made up of three bones. They do not support the body in any way, but serve as the attachments for various ligaments and muscles.

"Now that we've been hastily educated on the anatomy of the spine, the next thing is to see what can happen to make it hurt. Most of the trouble occurs in the lower back, so our discussion will be confined to this area.

"Probably the most common cause of low back pain is an inflammatory condition of the muscles called myo-fascitis. The actual cause is unknown, but it may very well be a virus. Pain on bending, lifting, or just plain sitting, with no history of injury is the usual story. (This can be particularly annoying to the pilot, who has to earn his living in the sitting position). The inflammation sets up a nodular swelling in the muscles, which is very tender, and can be felt like bunches of small grapes under the skin of the lower back. The result is the 'nagging backache', which, when any tension is applied to the inflamed tissue, can lead to severe pain and possible disability. The treatment of this condition is by the injection of a local anesthetic in combination with one of the newer cortisone preparations.

"Strains and sprains are the causes of most 'traumatic' backaches. These occur when too much tension is applied to a muscle or ligament. In a strain, the tissues are actually stretched, causing small hemorrhages, followed by swelling and painful limitation of motion. Minor strains recover within a few days. However, more severe strains may cause complete disability for from two to three weeks.

"Sprains are more serious injuries in that there is actual tearing of tissue with gross hemorrhage and swelling. These are extremely painful and completely disabling, requiring bed rest and often hospitalization. Depending on the severity of the injury, sprains may require a period of two weeks or more in a plaster jacket, to allow proper healing to take place. Rehabilitation will take several more weeks, for a total lost time of about six to eight weeks.

"One of the most common back complaints is, 'I was bending over to pick something up, and when I straightened up I had severe pain in my lower back.' This can happen to anyone, at any time, and frequently does. It may occur when only picking up a piece of paper, so we cannot say it's a back strain. What has actually happened is that as we bend forward, those 'facets' previously described will glide open to allow the forward motion. On returning to the erect position there may be a slight torsion of one of the vertebrae, or an uncoordinated movement of one of the muscles involved, or a facet may possibly open too far, and consequently, one of the joints may become jammed and unable to return to its resting position. This we call a 'subluxation', or a minor dislocation of the facet. Great stress is brought to bear on the facet, the surrounding structures, and the ligaments of both vertebra involved. Soon swelling develops, and the two bones are stuck tightly together. The surrounding musculature goes into spasms and there is severe pain. The patient walks with his back held stiff, usually with a list to one side. He can carefully lean forward, but is unable to bend backward without severe pain; and this last maneuver practically makes the diagnosis.

"The treatment of this problem is early 'reduction', which can often be done by manipulating the spine following the injection of a local anesthetic. If reduction cannot be accomplished by this method, then traction is necessary, at home or in the hospital. Medication is given to relieve the muscle spasm and pain. Once reduction has been accomplished, it will take about four weeks for the swelling around the facets to be absorbed and full, painless motion to be regained.

"Probably the most talked about, most often mis-diagnosed, and maltreated condition of the back is the herniated nucleus, or ruptured disc. We frequently hear the erroneous expression - which has become quite popular recently - 'slipped disc.' This is a term used by the laity and doctors untrained in back disorders, but is never heard at an orthopedic meeting. The reason is simple; there's no such thing as a slipped disc. It just does not occur.

"The intervertebral discs are made to withstand tremendous pressure. However, once in a while a rupture of a disc will take place and the soft nucleus bulges out through a tear in the cartilagenous ring. This protruding portion of the disc impinges on the nerve roots as they emerge from the spinal canal, causing pain and numbness in the leg. This usually happens suddenly, but it may also happen over a prolonged period. In the latter case, there has been an incomplete rupture of the disc and the soft nucleus 'leaks out' gradually. The result is the same; pain in the back with radiation to the legs, on one side or the other.

"With the presumptive diagnosis of a ruptured disc, hospitalization is usually necessary. Traction, and medication for the relief of pain is the first order of business. Once the acute phase has subsided, a special examination called a myelogram is done by injecting a certain amount of radiopaque liquid into the spinal canal and taking X-rays in various positions on a tilt table. The liquid will respond to gravity, moving up and down the spinal canal as the table is raised and lowered. If there is a ruptured disc present, the radiopaque column will be displaced as it flows past the area in question. It is the herniated nucleus pressing into the spinal canal that causes the displacement, and the presence of this defect makes the diagnosis.

"Treatment of this disorder always depends upon the individual case and the judgment of the attending physician. It can be removed by surgery, or, if the pain subsides and all symptoms disappear, a plaster jacket can be applied to allow healing of the disc by scar formation.

"Actually, in this article we've only skimmed the surface of a subject on which volumes have been written, but I hope it has given you some insight into the aches Homo sapiens must endure for the privilege of walking erect."

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CARE AND CLEANING OF OXYGEN MASKS

(The following material could be used as part of a squadron lecture on oxygen masks. Suggested tie-ins are the source material available to you on hypoxia and the article "Insidious Enemy" in the January, 1965 Approach.)

Perhaps the most important words concerning the oxygen mask--besides "Use it!"--are "Keep it clean!"

Frequency of Cleaning: Aviation equipment experts recommend that oxygen masks in constant use be cleaned every week. Pilots and crewmen using their masks infrequently should have them cleaned at least every two weeks. A mask should be cleaned once a month even if it is not used at all.

Cleaning Procedure: BACSEB 27-54 gives directions for mask disassembly, cleaning and reassembly. To refresh your memories, the steps for cleaning are as follows:

"(a) Wash check valves, ice shields, mask exhalation valve and mask thoroughly inside and out with lather made from cleaning compound, (Specification MIL-C-18687 Type II compound (FSN 9G 7930-577-5240)), and warm water." (In this connection, BuWeps has advised that this compound is satisfactory and no residue will result when .5 to 1 part compound is used in 100 parts water and when BACSEB 27-54's cleaning procedures are followed.) "A soft brush may be used to advantage in cleaning the mask. Caution: No toxic or flammable solvents shall be used for this purpose.

"(b) Rinse thoroughly in clean, cold water.

"(c) Wash the A-13A compensated mask exhalation valve. Shake out water and allow to dry. Do not blow out valve with compressed air as this may damage the valve.

"(d) Clean the mask microphone with a damp cloth.

"(e) Dry mask and accessories in a ventilated place. (Do not hang mask in sunlight.)"

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PEARLS....

1. We received this item from USS FORRESTAL (CVA-59):

"During recent pre-launch operations on the flight deck, an electrician trouble shooter was struck in the face with a deck bolt. His flight deck goggles prevented serious head and eye injury. This was the second experience within a month of his being struck by FOD at eye level. This man's comment to the flight deck corpsman was, 'Merry Christmas! You have given me the best present I could have--my eyes. Your constant surveillance on the flight deck has saved my eyes.'" Congratulations to that alert and persevering flight deck corpsman. His constant reminders to wear safety equipment surely paid off in this instance. Pass this along to your squadron personnel.

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IMPORTANCE OF SPATIAL DISORIENTATION IN PRODUCING ACCIDENTS

(This handout on spatial disorientation was written at Naval Air Station, South Weymouth, Massachusetts, as one of a series of "Notes from Sick Bay.")

Spatial disorientation in flight is experienced at one time or another by virtually all military pilots. The term vertigo as used in the strict medical sense refers to dizziness or a sensation of irregular or whirling motion, either of one's self or of external objects. As used by flight personnel, however, vertigo refers to many types of confusion or disorientation which occur in flight. To a pilot, vertigo means almost any type of subjective experience which does not correspond to objectively verifiable physical events. When a pilot experiences the sensation of flying in a banked attitude, and his instruments indicate he is in straight and level flight, he is said to be experiencing vertigo.

It is difficult to assess accurately the importance of vertigo in producing aircraft accidents. A report by the Air Force Directorate of Flight Safety Research, which lists the physiological stresses involved in major aircraft accidents in the period 1 July 1954 to 31 December 1955, indicates there were a total of 74 accidents involving 134 fatalities during this period in which vertigo was identified as a primary or contributing cause, or was suspected as such. (Naval Aviation Safety Center statistics for the period 1 July 1958 through 30 June 1963 show that accidents, including fatalities and non-fatalities, in which vertigo, spatial disorientation or illusions was a factor totalled 305.)

Accident statistics indicate the vertigo is sufficiently important in flight safety to warrant considerable attention. Pilots should understand the basis for vertigo, the effects upon the pilot, and appropriate corrective action. Vertigo should not be considered a completely incapacitating experience. Certainly most Naval aviators have learned to live with it.

In a recent study by the Navy School of Aviation Medicine, it was found that of 137 jet pilots who were questioned, 80% could immediately recall a personal experience with vertigo and, under further probing, an additional 16% were able to recall such an experience. It would appear that virtually every military aviator experiences vertigo at one time or another, yet they have learned to adjust to these sensations and to retain control of the aircraft while experiencing them.

Vertigo Syndrome

The basic task of a pilot of a modern aircraft is predominantly perceptual in nature. The operation of the aircraft controls is relatively simple, and can be learned readily using established Navy training procedures. The mastery of the perceptual problem in flying is considerably more difficult. The perceptual discriminations required of the pilot are more varied and more unusual than those commonly encountered on the ground. In addition, these perceptual discriminations must evoke immediate and extremely accurate response patterns.

There are a number of reasons why the perceptual discriminations involved in flight are considerably more complex and difficult than those on the ground. These may be separated into the following categories:

1. Limited Cues to Position

Visual cues are as important to proper orientation in the air as on the ground. However, in present day flight operations, there are many instances where visual cues are reduced virtually to non-existence. In flight under instrument conditions, visual contact with the ground is frequently lost entirely, and all visual cues to position must come from the aircraft instruments. The use of these symbolic visual cues involves a more complex integration than is found in ordinary contact flight.

2. Three Dimension Orientation Rather Than Two

When on the ground, orientation with respect to position is basically a two dimensional problem. In the air, however, the pilot is confronted with unique problems of orientation in three dimensional space, imposing an additional burden on his powers of discrimination. Another consideration in flight operations is that the third dimension, that of altitude discrimination, is the most important of the three.

3. Misleading Sensations from Receptors

Apart from the visual sense, the basic organ for perception of position is enclosed within the inner ear. The otolith organs give information on position at any one time; the semi-circular canals tell you when you are rotating.

The otolith organs are small, hollow spheres lined with sensitive hairs. Poised on the hairs are small bony crystals. Both the hairs and crystals are enclosed in a gelatinous membrane. The exact mode of operation of the otolith organs is unknown at present, but apparently the otolith organs indicate the direction of gravity because the weight of the small bone structures bends the hairs directly beneath them. Thus, the stimulus to the otolith organ would be rectilinear acceleration sufficient to cause a displacement of the small crystals. In ordinary turning and moving operations on the ground, everyone experiences rectilinear accelerations and decelerations. The extent of these forces, however, is magnified many fold in flight operations. Pilots must learn to operate under acceleration forces which may at times reach 5 to 6 G and last for many seconds. Under these conditions,

impulses from the otolith organ normally dominated by those from the visual sense, may reach such magnitude as to override the visual sense and produce unusual illusions.

On the ground, gravitational forces usually operate in a vertical direction only. In flight, however, a correctly banked turn may produce acceleration forces which, although still operating on the pilot in the head-to-foot direction, are now operating at right angles to the earth's gravitational field. The pilot's gravity receptors will suggest to him that he is in an upright position when he is actually in a bank. Normally this is no problem as long as the visual field is not obscured. Sensations from the organs of vision are sufficiently powerful to override those from the otolith organs. Under conditions of reduced visibility, however, the pilot can no longer trust sensory information from those organs. Although the pilot is required to operate in three dimensional space, the cues necessary for such operation may be completely inaccurate.

The semi-circular canals, also located in the inner ear, consist of three loops oriented in three mutually perpendicular planes. These canals are filled with fluid, and the inside walls are lined with sensitive hairs. Due to the viscosity of the fluid within the canal, a turning movement of the head causes the fluid to lag slightly behind the canal walls. The hairs project into the fluid and bend with the fluid's movement. In this manner they become the receptors which indicate the direction of rotation and to some extent the speed of rotation. The fact that each canal lies in a different plane allows the detection of rotation in three dimensions.

In more precise terms, the adequate stimulus for the receptors in the semi-circular canals is angular acceleration rather than rotation per se. In normal body movement, the angular acceleration lasts only a very short period of time and is followed almost immediately by cessation of rotation and therefore by angular deceleration in the opposite direction.

Thus normal head movements involve both acceleration and deceleration. If a person is rotated over a considerable period of time, the fluid in the canals will catch up with the canal walls; the hairs will no longer be bent, and the sensation of turning will cease. It follows that in a slow steady turn, the semi-circular canals are not reliable receptors. After a short period they may indicate to the pilot that he is once again "flying straight."

There is still another way in which the semi-circular canals can produce misleading sensations. At the cessation of a rapid turn, the fluid within the canal will be displaced in the opposite direction, thereby causing a corresponding displacement of the hair receptor cells. This produces the sensation of rotation in the opposite direction to that previously experienced, although no actual rotation is present.

4. Interactions Among Sense Modalities

In normal day-to-day activities, the visual sense and the proprioceptive sense are mutually reinforcing. In flight, however, these two sense modalities may be feeding diametrically opposed information to the central nervous system due to the action of centrifugal force on proprioception. It is the task of the pilot to learn the proper response to and evaluation of this conflicting information. He must learn at times to disregard visual sense data. At other times, he must be prepared to disregard sensations from his proprioceptive receptors.

The above discussion has indicated the underlying considerations which may lead to vertigo or spatial disorientation. There still remains the problem of describing vertigo in terms of its peculiar effects upon the pilot. These aspects will be covered in a later issue.

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CHEMICAL HEALTH HAZARDS AND THEIR CONTROL: Inhalation Hazards Due to Vapors, Fumes, Mists, Gases, and Dusts

Carbon Monoxide - The operator of a gasoline powered bucket loader complained of the exhaust gases. He was operating the loader inside a railroad boxcar unloading abrasive grit to a truck. Both doors of the boxcar were open but no mechanical ventilation was provided and the car was sheltered from the wind. Carbon monoxide concentrations of 250 parts per million (p.p.m.) existed while unloading and 400 p.p.m. while the motor was idling. It was recommended for immediate temporary measures that two forced air blowers be installed to circulate fresh air through the car. This reduced the working concentrations of carbon monoxide to the order of 50 - 100 p.p.m. For permanent corrective action consideration is being taken of the feasibility of installing a catalytic exhaust purifier on the loader.

Chlorine Exposure - Two employees reported to the dispensary complaining of exposure to chlorine gas. They stated that as they were passing by a pump house, they heard the alarm bell ringing. The alarm bell is designed to go off when chlorine concentrations in the building exceed a preset concentration. They opened a door and reeled back from the brief inhalation of chlorine gas coming out of the doorway. They were treated at the dispensary.

Two employees of the power plant came to the building, put on Rescue Breathing Apparatus (R.B.A.) entered the room where the chlorine cylinders were located, and turned off the main valve of the cylinder in question. Opening of doors provided adequate air to ventilate the contaminated room. There are three 1-ton liquid chlorine tanks in this room which is a part of the pump house. Two are stand by, and one is used for the apparatus which feeds chlorine into the salt water entering the shipyard mains. Power plant personnel will wear R. B. A. apparatus when they

proceed to locate the leak and correct this defect. It was indicated that signs will be prominently posted on this pump house with approximately the following wording: "Danger Chlorine" - "Do not Enter Without Putting on R.B.A. Mask." There are two sets of masks available in the pump room next door.

Decomposition of Halogen Solvents - Two employees welding inside a missile tube reported annoying concentrations of irritant gases shortly after welding was begun. One, with a history of bronchial asthma, reported to the dispensary for treatment. Investigation disclosed that surfaces had been inspected just previously by the dye check process which utilizes a developer containing trichloroethylene solvent and freon gas propellant. Traces of these gases in the missile tube were decomposed by the welding arc to produce hydrochloric and hydrofluoric acids and possibly phosgene. Welding in confined spaces requires local exhaust ventilation. This is particularly important if halogen solvents have been used in the area. The shop was reminded to enforce this requirement.

Solvent Hazard - An employee of the tool making section of the machine tool and foundry group whose job is primarily lapping precision gear parts complained of drowsiness, headache, and general fatigue. The lapping process is conducted inside a tightly sealed room equipped with an air filter and exhaust fan to maintain a dust free atmosphere. Observance of the lapping process showed that the employee was in almost continuous contact with a solvent, which is used as a degreasing and cleaning agent. The process involves wiping the work part by hand with a paper towel soaked in solvent. The used towel is then discarded into a closed container. Air samples taken at the breathing zone of the employee indicated solvent exposures approaching the maximum allowable limit of 500 parts per million during periods of heavy work loads. Carbon dioxide concentrations were found to be normal. It is planned to install local exhaust ventilation to reduce the solvent exposure without giving rise to dust interference. It was advised that the employee, in the meantime, use a chemical cartridge respirator during prolonged use of the solvent.

Solvent Vapors - Irritation of the eyes and throat from a solvent used in the Magna Glow process was reported. Personnel were working in an enclosure that was unventilated, An ultraviolet lamp heater used for inspection work vaporized more of the solvent than is normally released by normal evaporation. In order to eliminate the problem it was suggested that the solvent be replaced by water and/or the area be provided with mechanical exhaust ventilation to remove the kerosene type vapors.

---- Occupational Health Hazards No. 41
BuMed and Surgery

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PEARLS....

1. A couple of recent MOR's, in which the flight surgeons did check survivors' ears after rescue from JP-5 contaminated water, reminded us to pass along this reminder to you: Be sure to clean ears when JP-5 has been involved and check them for dermatitis.

2. We picked up a good item on a liaison trip to the Second MAG Wing at Cherry Point last month: The squadron survival officer, equipment officer and flight surgeon attend the total training course on personal safety and survival equipment. During the ensuing week (when the squadron is deployed to the Aviation Physiology and Training Unit) these officers present the lectures to their own pilots under the supervision of the unit instructors. This method is new to this field and deserves commendation. Captain Sidney I. Brody is inaugurating this program and he will detail its provisions in an appropriate manner when he has had time.

3. Comptroller has stated that in future there will be no more free lunch to complain of. The pilot can complain about his wife's cooking now.

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TABLE OF CONTENTS, FLIGHT SURGEON'S NEWSLETTER 2-65

ENCLOSURE 1

This material is from the Medical Department, Marine Corps Air Station, Beaufort, South Carolina. Because of space limitations, enclosures (5) and (6) will be printed in a later issue of the Flight Surgeon's Newsletter.

MEDICAL DEPARTMENT INSTRUCTION 6700.1A

From: Medical Officer
To: All Medical Department Personnel

Subj: Standard Procedures for Maintaining Emergency Equipment in a State of Readiness

Ref: (a) BUMEDINST 6700.26 series

Encl: (1) Inventory of Crash Bags
(2) Inventory of Flight Surgeon's Bag
(3) Inventory of Specimen Collecting Kits
(4) Inventory of Ambulances
(5) Memo to Pathology Dept., U. S. Naval Hospital, Beaufort, S. C.
(6) Directions for shipping Tissue Specimens

1. Purpose. To promulgate a list of materials to be carried in the Medical Department's Crash Bags, Flight Surgeon's Bag, Specimen Collecting Kits, and Emergency Vehicles in order to insure that they are constantly in a state of readiness.

2. Background. In order for the Medical Department to meet its assigned mission, it is necessary to maintain all emergency equipment in a constant state of readiness. Therefore, in accordance with reference (a), a list of materials, enclosures (1), (2), (3) and (4), has been compiled to enable medical personnel to cope with the majority of emergency medical situations encountered.

3. Instructions.

a. It shall be the responsibility of the Senior Corpsman assigned to the Emergency Dressing Room to maintain the emergency equipment in a constant state of readiness.

b. He shall inventory the emergency equipment, in accordance with enclosures (1), (2), (3) and (4), on the first working day of the month and immediately correct any discrepancies. Every effort should be made to inventory the vehicles in such a manner that will not impede the emergency use of same during the time of inventory. Whenever the Crash Bag seal is broken an inventory must be completed immediately.

c. The inventory log will be signed by the corpsman. Any major discrepancies will be reported in writing via inter-office memo to the Crash Officer.

4. Location.

a. Crash Bags. They will be located in the Duty Crash Wagon and the Metropolitan Ambulance during the hours of 0630 to sunset or secure from flight quarters, whichever is later. They will then be kept in the Corpsmen's Duty Room under the cognizance of the Chief of the Day. This precaution will be taken to avoid the possibility of theft of the narcotics contained in the Crash Bags.

b. Flight Surgeon's Bag. It will be kept in the Duty Crash Wagon at all times.

c. Specimen Collecting Kits. There will be six kits maintained in the following locations;

(1) Metropolitan Ambulances - one (1).
(2) Duty Crash Wagon - one (1). (Placed in the Flight Surgeon's Bag.)
(3) "Off Duty" Crash Wagon - one (1).
(4) Record Office - Three (3). (Placed in the file cabinet with the Medical Officer's Aircraft Accident Reports (MOR) Forms. These are to be checked out to Medical Department personnel accompanying Squadrons on deployment.)

INVENTORY OF CRASH BAGS (Enclosure 1)

DRUGS

1. Aminophylline Injection 7½ gr.	2 vials
2. Ammonia Inhal.	6 amps
3. Alcohol 70%	2 oz
4. Bacitracin Ointment	1 tube
5. Brandy 2 oz	2 bottles
6. Caffeine - Sodium Benzoate	1 amp
7. Epinephrine 1/1000	1 vial
8. Lidocaine 1%	1 vial
9. Merthiolate Tincture	2 oz
10. Morphine Syrettes	5
11. Soap Phisohex	2 oz
12. Sodium Amythal	1 unit
13. Atrophine Inj. Syrettes	1
14. Nembutal 100 mgm	6 caps
15. Wyamine	1 bottle (10 cc)

OPTHALMIC OINTMENTS

1. Sulfacetamide	1 ea
2. Tetracaine Ointment	1 ea
3. Tetracaine Eye Drops	1 ea

DRESSINGS

Bandaids	20
Ace Bandages 2"	2
Ace Bandages 3"	2
Ace Bandages 6"	1
Eye Pads	4
Gauze Squares 2x2	1 pkg
Gauze Squares 4x4	1 pkg
Vaseline Gauze	4 pkgs
Roller Gauze 1"	1 roll
Roller Gauze 3"	2 rolls
Tape 2"	1 roll
Triangular Bandage	2
Battle Dressing Small	2
Battle Dressing Medium	2

INVENTORY OF CRASH BAGS con't

STERILE SUPPLIES

1.	Cotton Swabs in tube	15
2.	18 gauge needle	2
3.	Knife blades in solution 10, 11 & 15	1 ea
4.	15 gauge needle as tracheotome	1
5.	Suture Set with 4-0 silk and 4-0 gut with needles, knife and blades	1
6.	Assorted hypo needles 26, 23 and 2 gauge	2 each
7.	Syringe 2 cc	1
8.	Syringe 5 cc	1
9.	Syringe 10 or 20 cc	1
10.	Sterile Towels	4
11.	Tracheotomy Set	1

OTHER SUPPLIES

1.	Blood pressure cuff	1
2.	Vial files	2
3.	Flash light with batteries	1
4.	Pencil, skin marking	1
5.	Bandage scissors	1 pr
6.	Splint, mesh roll	1
7.	Stethoscope	1
8.	Tongue depressors	15
9.	Tourniquet	1
10.	Resusitube	1
11.	Emergency Medical Tags	1 bk

INVENTORY OF FLIGHT SURGEON'S BAG (Enclosure 2)

1.	Rubber Body Bag	1 ea
2.	Flight Suit	1 ea
3.	APH5 Helmet	1 ea
4.	Specimen Collecting Kit (Packed in a manner that will prevent breakage)	

The following items will be boxed together to prevent breakage.

5.	IV Set	1 set
6.	Adhesive Plaster 1"	1 roll
7.	Arm Board	1 ea
8.	Tourniquet	1 ea
9.	Dextran 500 cc	1 bt

INVENTORY OF SPECIMEN COLLECTING KIT (Enclosure 3)

1.	Copy of Memo from Medical Officer, MCAS, to Pathology Dept., Naval Hospital containing instructions for collecting blood and tissue specimens (enclosure (5)).	
2.	5 ml Vacutainer tube, oxalate, marked "Glucose"	2
3.	10 ml Vacutainer tube, oxalate, marked "Alcohol"	2
4.	10 ml Screw top tube, oxalate, marked "C.O."	2
5.	Paraffin block	1
6.	Mineral Oil 4 oz bottle	1
7.	Syringes, 50 ml, 10 ml and 5 ml	1 ea

INVENTORY OF SPECIMEN COLLECTING KIT con't

8. Wide mouth jar, oxalate, marked "Add 30 ml blood"
9. Vacutainer adaptor
10. Knife handle
11. Blade, surgical [illegible] — 1 pk
12. Needles, in sterile [illegible] — 2 ea
13. Plastic Specimen Bags - 4 sizes — 10
14. [illegible] — 1 bx
15. Gloves, surgical size [illegible] — 2 pr
16. Gauze Squares 4x4 [illegible]
17. Copy of Direction for [illegible]

INVENTORY OF AMBULANCE [illegible]

METROPOLITAN AMBULANCE

1. Wheeled Ambulance Stretcher
2. [illegible]
3. [illegible] oxygen wrapped in [illegible]
4. Straight jacket
5. Restraint set with bag
6. Blanket
7. Splint set
8. IV set (2)
9. IV Solutions ([illegible])
10. Crash Bag
11. Specimen Collecting Kit
12. Sheets, sterile (4)

DUTY CRASH WAGON

1. Resuscitator
2. Stokes Stretcher
3. Army litter
4. Oxygen
5. Bags
6. Splints
7. Foul weather gear
8. Sheets
9. Crash Bag
10. Flight Surgeon's Bag
11. IV Sets (2)
12. IV Solutions (Dextran, [illegible])
13. Sheets, sterile (4)

[illegible]

1. [illegible]
2. [illegible]
3. [illegible]
4. Poncho
5. IV Sets (2)
6. IV Solutions (Dextran, 5% D/W, N. Saline)
7. Specimen Collecting Kit
8. Sheets, sterile (4)

ENCLOSURE 2

OFFICER CHECK-IN AND "DEAR DEPENDENT" LETTER

The following material is in use at the Naval Air Station, Patuxent River.

1. Name Rank Ser No.
2. Activity Reporting From:
3. Activity Reporting To:
4. Flight Status at Last Activity: Up Down Service Group
5. Date of Last Annual Physical Schedule if Due
6. Blood Type Rh Factor
7. Current SF-89 in Health Record: Yes No
8. BUMED Approved SF-88 in Health Record: Yes No
9. Age Ht Wt Std Wt Max Wt
   (Brief on weight clinic when indicated)
10. Shots Due Shots Given

11. Blood Pressure: Recumbent Standing
12. Pulse: Recumbent Standing After Exercise
    Seconds to Return to Normal CER
13. Baseline ECG in Record: Yes No (If Not, Schedule)
14. "Dear Dependent Letter" issued: (see below) Yes No
15. Clearance notice issued: Yes No
16. Reviewing Corpsman's Signature Date
17. Flight Surgeon's Signature and Interview Date

DIST: Make original only
File in NavMed 10 when completed
Place on DR's desk for review if not present

* * * * *

Dear Dependent:

I well realize that this is quite an ambiguous term to use to someone who means so much to each husband or male relative in the military service. Were it at all possible I would send this letter personally to each of you and if time were available would be happy to sit and discuss it with you.

We of the Medical Department are faced with a problem which we feel you are able to help us with. We are faced with a shortage of military physicians - not critical but very noticeable to the extent that we are not able to see all the people who would like to be seen, and certainly not always at the time they want to be seen.

The Manual of the Medical Department of the United States Navy, which is our working text, states that "medical care shall be limited to those dependents residing in the areas which the facilities have been designated to service. The Medical care shall be contingent upon the availability of

space and facilities and the capabilities of the professional staff as determined by the Medical Officer in charge and shall be considered secondary to the primary mission of the Medical Department -- to maintain and restore the health of members of the Armed Forces on active duty.

Now, as a dependent, I would like to refresh your memory about some of our policies and problems here at Patuxent River. First, service provided will be by the appointment system. Routine appointments are during the hours and on the days indicated below. Bona fide emergencies are seen anytime.

SCHEDULE OF DEPENDENT CLINICS AT THE STATION HOSPITAL

In order to provide the best possible medical care with a minimum delay for the large number of dependents in this area, the schedule listed below should be adhered to, except in emergencies. For appointment call the following numbers: (A list of clinics and extensions has been deleted here.)

Emergencies. After normal working hours and on Saturdays, Sundays, and Holidays, only dependents with an emergency or with an appointment will be seen at the Station Hospital.

Navy regulations state that "except in cases of emergency, out-patient medical care for dependents is to be routinely available only during the regular working hours of the facility" (BMI 6230.31 Encl 1-E-2, Para 2b). Routine working hours here are 0800-1630 Monday through Friday excluding holidays.

There are many valid and strategic reasons for the above mentioned hours, for it is then we have the most qualified people available in the diagnosis and treatment of your specific ailment. It is true that we do have a medical officer and small skeleton crew on duty at all times. After normal working hours they are to care for emergencies only and for the people already hospitalized. I do not need to remind those who have occasions to travel the neighboring highways that all too many emergencies necessarily confront this skeleton crew after normal working hours.

Our biggest problem at the Station Hospital is concerned with after hours or holiday and weekend visits. There are too many dependents being seen during these periods who could have been seen during normal working hours or normal working days. 'Tis true that your illness only started in the morning and became worse at night - the time some of you consider is the most convenient time to visit the doctor - "at least then maybe I won't have to sit and wait so long" or "I wasn't able to get a ride" or "I wanted to wait until my husband got home and made the decision."

Please call our Out Patient Clinic to seek an appointment for your medical problem. Very seldom is there a long wait for these appointments. The nurse, corpsman or corpswave on duty will be glad to help you and frequently may be able to advise you so that a visit may be unnecessary. If you feel you cannot get an appointment soon enough, ask for an earlier one, and failing in that come to the Receiving Room at anytime during routine working hours, or if emergency, anytime.

I know the question you all have in mind is, "well, what is an emergency as referred to in the above statement?" I think all of us -- doctors and laymen will understand and agree on the greater majority of emergencies. It is that very definite grey or shaded area with which we have difficulty. I think we would both easily agree that an emergency is a sickness or injury which cannot wait for an appointment or cannot wait until the next normal working day.

If you, as dependents, honestly feel that such an emergency situation exists, phone or come in.

I do hope that you will remember that the Station Hospital doctors have a primary mission of caring for the military and that after normal working hours they are here for care of the military, hospitalized patients and strict emergencies, the greater majority of which are military. When you were a growing child, there were a number of home remedies that your mother used to care for your minor aches and pains. She did not take you to the doctor for a common cold or other minor complaints, and please help us to better serve you when you do need us by caring for yourself in such instances.

Here are some "DO's" and "DON'T's" you could follow:

1. DO call the Station Hospital and make an appointment. After hours, if you have what you consider an emergency please call extension .... prior to coming in.

2. DO try proved home remedies for a minor ailment prior to presenting it at the Station Hospital.

3. DO remember that our best medical care can be offered you during normal working hours and the primary purpose of the doctors here at the Station Hospital is to care for the military.

4. DON'T wait until your husband comes from work with the car so that you can get transportation. Ask the neighbor or seek transportation elsewhere, or finally, call your husband at work if the need is that urgent.

5. DON'T just "drop by" the Station Hospital while performing other errands on the base during the weekend.

6. DON'T ask for more routine "checkups" - they were services of the past which cannot be done now due to physician shortage.

7. DON'T allow any of your dependents under 16 to come for treatment unless you bring them.

8. DON'T bring your well children into the various clinics where sick people are unless your children are in need of treatment - you expose them to possible contagious diseases unnecessarily.

9. DON'T be one of those dependents who has lost her dependent's medical privileges because she consistently abused those normally afforded her.

As the Medical Officer, the care of the sick is my major responsibility and I will do everything possible to see that you get excellent care. I well realize that when your husband is deployed your problems at home are frequently greater and we are here to help you. We can give you better care, examine your sick child more adequately, and talk your problems over with you - if we do not also have a number of people with common colds ahead of you. But you do have to remember that care of the military must come first. Also if your husband deploys with an air group, some of our doctors may also go, thus giving us fewer doctors to care for you as dependents.

Please help us to help you.

Sincerely,

(Signed)

CAPTAIN, MC, USN
MEDICAL OFFICER

Flight Surgeon's NEWSLETTER

(This material is for the information of Navy flight surgeons only and does not necessarily reflect endorsement by the Navy or the Naval Aviation Safety Center.)

SPATIAL DISORIENTATION

(This item by LT P. B. Nedlemann MC, USN, USNAS, South Weymouth, Mass., is continued from last month's Flight Surgeon's Newsletter.)

1. Vertigo of Attitude and Motion

This includes those cases in which there is confusion with regard to the attitude and movement of the pilot and the plane. This type of vertigo customarily takes place under conditions of reduced visibility. The following is an example of such an effect:

"I was flying number two in two-ship formation in night weather. During a left penetration turn I thought I was turning right, and when we rolled out I felt as though we were inverted. I kept on flying the wing and took a glance cross-check of my instruments and finally everything straightened out."

Experiences such as this are a function of the inability of the receptors within the ear to give correct information concerning the location of the vertical at all times during flight and to indicate correctly turning movements. This type of confusion with regard to attitude and position is apparently the most common type of vertigo experienced by military pilots.

2. Visual Vertigo

There are three basic types of confusion which may be classified as visual vertigo. These are:

Autokinesis

An individual in virtually total darkness attending to a single point source of light will frequently report seeing the light move. Individuals have also reported such movement when viewing a stationary black target against a homogeneously illuminated visual field. Such apparent movement of a spot of light is known as the autokinetic illusion. In the appropriate set of circumstances, most people will experience such a movement. The autokinetic effect can and does produce very dangerous situations during night flying. The following report illustrates the manner in which this effect operates:

"While in a night bounce pattern at Kingsville, I followed a group of lights upwind thinking it was another plane. Not until I was almost over it did I realize it was a lighted oil well. It seemed as though it was moving, but in no particular direction."

The autokinetic illusion can be attributed mainly to the involuntary movement of the muscles that control the eyeball. When a person gazes at a single source of light, his eye is continually engaged in a series of tiny movements. Under normal conditions the perception of apparent motion of any object is controlled by other objects in the visual field. In night flying the visual field is impoverished and small light sources appear to move of their own accord.

The Oculogyral Illusion

When an illusion is created by the reception of conflicting impulses from the eye and the semi-circular canals, it is known as an oculogyral illusion. For example, at the cessation of fairly rapid rotation, objects may appear to move even though they are fixed in position. This is due to the continued movement of fluid within the semi-circular canal following the completion of the rotation. The pilot will experience this illusion as an apparent movement of objects in his visual field in a direction opposite to that of the previous rotation.

When flying radar-intercept missions and tracking a moving target, the oculogyral illusion is an effect which could seriously impair the performance of an intercept pilot.

The Oculogravic Illusion

The oculogravic illusion is produced by a conflict between sensations from the eye and those from the otolith organs. Whenever a gravitational force or acceleration force is not in the vertical axis of the aircraft, or from the head to feet of the pilot, visual perception may be affected. The following is an example of the oculogravic illusion:

"During the initial dive in the chandelle and the first part of the dive in the diving turn, the light appeared to move down. As the climbing or diving turn became established, and the G force increased, the star appeared to move and at the same time be sharply displaced up."

3. Fascination

Fascination is defined as a condition in which the pilot fails to respond adequately to a clearly defined stimulus situation in spite of the fact that all of the necessary cues are present and the proper response available to him. An analysis of pilot experiences with fascination classified these experiences into two categories:

Type A Fascination is fundamentally perceptual in nature. The individual attends to one aspect of the total situation to such a degree that he rejects other factors in his perceptual field. The following is an example of Type A Fascination:

"My instructor was teaching me how to make emergency landings on a small field. I had made one or two tries and hadn't been very successful. The next time I was determined to make a good approach. Both the instructor and I were so completely engrossed in the task that we failed to hear the landing gear warning horn. Consequently we landed with the wheels in the up position."

In Type B Fascination the individual may perceive all of the significant aspects of the total situation, but still be unwilling or unable to make the proper response. The following is an example of Type B Fascination:

"I went into a skidded turn stall during a small field shot. I knew I was in unbalanced flight during the last turn, but as I recall I was so determined to get a straight away before hitting the field that I didn't seem to care what happened. The plane stalled, and the instructor took over."

As with the other types of vertigo, fascination has apparently been experienced by virtually all military pilots. As yet, however, no estimate has been made of the number of aviation accidents which may have been produced by such "target fixation."

4. Flicker Vertigo - Attention, Helicopter Pilots!

There is one additional type of vertigo which occurs quite rarely but can be most devastating in its effects. A steady light flicker, at a frequency between approximately 4 to 20 per second, can produce unpleasant and dangerous reactions in normal subjects, including convulsion, nausea, unconsciousness, or vertigo. The exact physiological mechanisms underlying such reactions are not known. However, it is believed that susceptibility is increased when the pilot is fatigued, frustrated, or in a state of mild hypoxia.

The following is a dramatic report of the manner in which flicker vertigo can occur:

"After flying for some time at an altitude of 16,400 feet, a pilot in a single-seater propeller aircraft made a perfect landing. However, he did not taxi the plane to the hangar. Instead, the plane remained motionless, its propeller revolving slowly. The pilot was found bent over the controls, unconscious. At first it looked as though the pilot had not used his oxygen mask. However, in this case, the pilot had lapsed into unconsciousness after making a good landing. The rays of the low-lying sun were shining on the slowly-turning propeller blades. Reflected flashes of light were being thrown on the pilot's face at a rhythmic rate of about 12 per second."

#

OCCUPATIONAL HEALTH HAZARDS

The following items are reprinted from Bureau of Medicine and Surgery's Occupational Health Hazards Release No. 41.

Hydrocarbon Solvent Vapors - Investigations were made of potential atmospheric contamination in two watch repair shops operated by the Navy Exchange. These shops use ammonia solution and proprietary watch cleaning and rinsing solutions containing hydrocarbon solvents. The latter are used in ultrasonic cleaning machines which mechanically generate appreciable heat, some of which is incidentally transferred to the solvents used. With frequently repeated or continuous ultrasonic cleaning operations, hydrocarbon vapors are generated at accelerated rates that require control. Ventilation was found adequate in one of the watch shops; however, in the second shop, a space measuring 8' x 6' x 10', there were no provisions for ventilation control. It was recommended that mechanical ventilation be provided to control potentially hazardous chemical vapors in this watch shop.

Hydrogen from Battery Charging - While on a safety committee inspection tour, industrial hygiene personnel found a ventilating fan in an inoperative condition in a room which housed a large bank of lead-acid batteries and automatic battery charging equipment. The room was also used as a locker room, and some cigarette butts were observed on the floor. All cognizant parties were promptly informed of the hazardous conditions and these corrective actions were taken without delay.

a. The exhaust fan was repaired and put into operation.

b. The use of the room as a locker room was stopped, and lockers were moved out.

c. Entry into the room was restricted to authorized personnel only.

d. A prominent "No Smoking" sign was displayed.

e. Lighting and light switches in this battery room should be of the explosion proof type.

f. Investigate switches and other possible arcing devices in the automatic charger to determine if they are explosion proof. If not explosion proof, modification should be made.

Paint Vapors - Three enlisted personnel from a helicopter squadron carrying out paint spraying operations in a confined area were treated for inhalation of paint vapors and released for duty. No hospitalization was necessary. The following precautionary measures were emphasized:

a. Proper ventilation in confined areas

b. The use of air-line respirators

c. Enforcing the local station labeling program

Safety Solvent - The use of a proprietary safety solvent in an engine room of a naval vessel was reported to be causing severe eye and respiratory complaints due to the chlorinated hydrocarbon present. Investigation revealed that neither local mechanical exhaust ventilation nor appropriate respirators were used. Recommended exhaust ventilation rates for processes aboard ships releasing toxic vapors was provided as follows:

Volume	Exhaust Rate
1,000 cu. ft.	1,000 cu. ft/min.
3,000 cu. ft.	2,000 cu. ft/min.
10,000 cu. ft.	5,000 cu. ft/min.
30,000 cu. ft.	10,000 cu. ft/min.

Health Hazards Due to Contact with Skin

Chemical Burn - A welding student dropped a glass-dropper bottle of dilute nitric acid and some splashed on his right hand, producing a chemical burn. Though the burn was not severe, an investigation of chemical handling and labeling was made at the welding school. It was recommended that an unbreakable, plastic-dropper bottle be used for nitric acid instead of glass, and that all hazardous chemicals be labeled in accordance with the Navy Label Code Chart.

Chemical Burn - At 0900 an employee started unloading creosote treated timbers from a railroad car. By 1000 hours, some eye irritation was noted. By 1330, irritation had increased markedly and the employee reported to the dispensary. Diagnosis was "severe chemical burn - both eyes."

The employee had worn protective clothing and had used a greasy protective cream on his face. The hot, humid weather caused the worker to perspire profusely with some of the perspiration running down his forehead into his eyes. Since creosote belongs to the family of chemicals which are photosensitizers, the irritating effect was accelerated by the bright sunlight.

The following recommendations were made:

a. The face should be treated with a suitable non-greasy protective cream.

b. Use a sponge sweat band to absorb perspiration.

c. Wear chemical goggles to prevent corrosive and/or irritating materials from contact with the eyes.

Dermatitis (contact with oil) - An employee from a Navy supply center was sent to us from the dispensary with a rash on both arms. It was found that he had been "sounding" large oil tanks with a ½" wide steel tape. On pulling the tape back in, he accidentally made contact with the oil on his arms and hands. A rash developed which he thought was caused by the 2% cyclohexanone additive in this oil. The rash was not painful; it only itched. He had been exposed

to organic fuels for about 30 years and had never had this problem before. He was on a diet at present and felt that the possibility of the rash being the result of food he recently ate is not likely. He was patch tested with the oil in question for a period of 24 hours on his back. The result was negative. It was difficult to make any definite conclusions as to the cause of the rash, but it was recommended that he wear neoprene gloves in future tasks of this nature.

Dermatitis (contact with weeds) - A public works center employee reported with a dermatitis on both arms. It was found that he had been clearing brush and weeds for the purpose of telephone pole installation. He had been employed in this job for about three weeks previously. The rash only covered the area on his arms from the wrists to halfway up the upper arm, where his short sleeved shirt terminated. He wore gloves so the hands were not affected. It was thus felt that the dermatitis was caused by frequent exposure to weeds. It was recommended that he wear long sleeved shirts and gloves in the future in this type of work.

#

PEARLS....

. The Aerospace Medical Convention is 26-30 April in New York City. Try to make it!

. We still need articles for the Flight Surgeon's Newsletter. Won't someone make an effort to show off some small tidbit of what he knows?

. Dr. Walt Gable, SMO on the TICONDEROGA, has received BuPers orders to NASC to arrive in the near future. No nomination has yet been made.

. The Safety Center will have another display at the Aerospace Medical Convention in New York this year. Be sure to see it!

. Have just received a fine periodical from LT Ron AMALONG, CAG-8 flight surgeon, entitled "Notes off the (Blood Pressure) Cuff." A real fine idea. We'll be using these from time to time as enclosures to give you non-thinkers ideas about how it might be done.

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VERY IMPORTANT NOTICE!

The original Medical Officer's Report and Aircraft Accident Report are now routed through the chain of command for endorsements and have in the past contained pictures of aircraft accident victims.

Because these reports are now routed to non-medical personnel, it is most important that all photographs of injuries, fatalities, etc. be sent under separate cover to Code 40, U. S. Naval Aviation Safety Center, SP-50, NAS, Norfolk, Virginia 23511. (Code 40 is the Aero-Medical Department.)

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ENCLOSURE 1

(This material is a continuation of last month's reprint of Medical Department Instruction 6700.1A, Marine Corps Air Station, Beaufort, S. C. The Instruction and enclosures 1 through 4 appeared in FSNL 2-65. Following are enclosures 5 and 6 to the Instruction.)

M E M O R A N D U M

From: Medical Officer, MCAS, Beaufort, S. C.
To: Pathology Department, USNH, Beaufort, S. C.

Subj: Pathology Procedures in Event of Aircraft Accident; submission of

Ref: (a) BUMEDINST 6510.2B
(b) BUMEDINST 6510.3B
(c) BUMEDINST 6510.4A
(d) BUMEDINST 6510.5A
(e) BUMEDINST 6510.6
(f) OPNAVINST 3750.6E

1. In the event of an aircraft accident in this area involving Naval or Marine Corps aircraft and personnel, an Accident Investigation Board is immediately appointed with an air station flight surgeon as a member. The flight surgeon will immediately contact your department for assistance in conducting his investigation.

2. The following is an outline for collecting and handling specimens of tissue and body fluids as required by references (a) through (e). All of the specimens and examinations listed below (except toxicological examinations which are done at the discretion of the pathologist or flight surgeon) are required in all accident investigations, in compliance with reference (f).

3. Each investigating flight surgeon will have access to specimen collecting kits designed at this dispensary to aid and speed the preparation of specimens for shipment. Your advice and cooperation can be of great value in continuing the Navy's extensive and important program of accident investigation.

A. BLOOD: This specimen is the most difficult to obtain. Collect it as soon as possible.

(1) PATIENT ALIVE ON ARRIVAL - PROGNOSIS FAVORABLE

(a) BLOOD GLUCOSE: See (b) below.

(b) BLOOD ALCOHOL: These two tests are to be performed at USNH, Beaufort. Collect whatever volume is necessary.

(Enclosure (5))

(c) BLOOD CO: To be done at Naval Medical Center, Bethesda, Md. Collect 10 ml over 10 mg lithium oxalate, cover with mineral oil, place screw cap on, and then seal with paraffin. It will be picked up by MCAS personnel for shipment.

(2) PATIENT DEAD ON ARRIVAL OR EXPIRES IN HOSPITAL

(a) BLOOD GLUCOSE: Same as above

(b) BLOOD ALCOHOL: Same as above

(c) BLOOD CO: Same as above

(d) BLOOD FOR OTHER TOXICOLOGICAL STUDIES: To be done at AFIP. Collect 50 ml of blood over 50 mg of lithium oxalate in a wide mouth jar, cover with mineral oil, freeze, place cap on, and seal with paraffin. Place back in freezer. It will be picked up by MCAS personnel for shipment.

B. URINE: (1) PATIENT ALIVE ON ARRIVAL - PROGNOSIS FAVORABLE

(a) Routine urinalysis with microscope. To be performed at USNH, Beaufort, S. C. Collect whatever volume necessary.

(2) PATIENT DEAD ON ARRIVAL OR EXPIRES IN HOSPITAL

(a) URINE FOR TOXICOLOGICAL STUDIES: To be performed by AFIP. Collect all available urine in a wide mouth jar, cover with mineral oil, freeze, place cap on, then place in freezer. It will be picked up by MCAS personnel for shipment.

C. TISSUE SPECIMENS - QUICK FROZEN AND REMOVED AT AUTOPSY:

The following specimens should all be placed in individual plastic bags, heat sealed, and placed in freezer immediately. To be picked up by MCAS personnel for shipment.

(1) LUNG: Collect about half of each lobe

(2) LIVER: 150 to 200 gms.

(3) KIDNEY: Half of each

(4) BRAIN: One cerebral hemisphere, half of cerebellum and spinal cord.

(Enclosure (5))

(5) BONE MARROW: All available. This is mandatory if soft tissue has been destroyed or rendered valueless by fire, otherwise optional.

D. TISSUE SPECIMEN - REMOVED AT AUTOPSY:

A portion of every organ is removed and placed in 10% formalin. These slices should be no more than 1 cm in thickness for proper penetration of the fixative. Seal bottle with paraffin. To be picked up by MCAS personnel for shipment.

It is preferred that the microscopic examination be done at USNH, Beaufort if time and facilities permit. The report is to be sent to the investigating flight surgeon.

E. TAGGING: All specimens should be tagged for proper identification with:

(1) Name, Rank, Service Number

(2) Name of tissue

(3) Time of accident

(4) Time of death

(5) Time of collection of specimen

(6) Brief history of the accident

SIGNED

MEDICAL OFFICER

(Enclosure (5))

Enclosure 1
to FSNL 3-65

DIRECTIONS FOR SHIPPING TISSUE SPECIMENS

1. On the day before shipment is to be made, have Medical Supply draw petty cash from the Navy Supply Dept. to purchase dry ice.

2. On the morning of shipment, have Motor Transport dispatch a driver with petty cash to Savannah to purchase 10 pounds of dry ice, at about $.15 per pound. Dry ice can be obtained from (local source listed here).

3. Obtain specimens from the Laboratory, USNH, Beaufort and place in refrigerator to be kept frozen until dry ice is delivered. (See attached Memorandum for type and amount of tissue to be collected.) Specimens should be sealed and frozen without a preservative and labeled as per Memorandum.

4. Deliver frozen specimens and dry ice to Shipping and Receiving Dept. for packaging and Bill of Lading. Have driver take package and Bill of Lading to Railway Express in Beaufort (To be sent Air Express). Package is then to be delivered to Air Express Office at the Charleston Airport. The driver is to obtain the following information and return to the Dispensary, MCAS, Beaufort.

a. Name of Airline
b. Flight Number
c. ETD from Charleston
d. ETA in Washington, D. C.

5. When the above information is returned to the Dispensary, a long distance phone call is authorized to:

Director, Armed Forces Institute of Pathology
Washington, D. C.
ATTN: Section Forensic Medicine and Aviation Pathology
Telephone No. RAndolph 3-1000, Ext. 2889/2910 and relate the above information so that a driver will be waiting in Washington to accept package.

6. NOTE: Speed and timing is essential as the specimen should not be allowed to thaw.

(Enclosure (6))

Enclosure 1
to FSNL 3-65

ENCLOSURE 2

HEALTH HAZARDS ASSOCIATED WITH PROSEAL 777 POTTING COMPOUND

1. ProSeal 777 is a potting compound used to pot teflon wires in electrical connectors on the RF-4C aircraft. This compound comes in two parts, a base and an accelerator. The two parts must be mixed in order to be used. As soon as mixing is accomplished, highly toxic vapors of toluene diisocyanate (TDI) are liberated. These vapors are liberated throughout the mixing, pouring, and curing procedures until such time as the compound is completely cured.

2. Toluene diisocyanate, probably the most toxic material currently being used by field level maintenance squadrons, has a maximum allowable concentration in air of 0.02 parts per million. Overexposure by inhalation of TDI vapors leads to severe mucous membrane and respiratory tract irritation. There is a wide range of individual susceptibility to TDI vapors. In some cases, symptoms will develop on short exposures to high concentrations of the chemical, while in others, the symptoms develop after prolonged exposure to low concentrations. Individuals become sensitized to TDI, and when a worker becomes sensitized, there results an allergic state in which the threshold is lowered, so that symptoms appear again at progressively lower concentrations of TDI vapor. The overexposure symptoms of a non-sensitized worker include complaints of burning, itching eyes, stuffy or runny nose, sore throat, dry cough and difficulty in breathing. There may also be in addition, nausea, vomiting and insomnia. Symptoms in the sensitized worker are some what different. These include frank and severe asthmatic episodes that may result from minute exposures. In the case of older workers, or those with previous bronchial disease, cardio-pulmonary damage may occur, resulting in death. Removal from exposure to TDI soon brings about cessation of symptoms.

3. Skin contact with uncured ProSeal 777 can cause skin irritation. Any contact with the uncured material should be avoided.

4. In order to control hazardous exposure to TDI from the ProSeal 777 it is recommended that the following measures be taken:

a. Attempt to locate a less toxic substitute potting compound that will satisfy the job requirements without compromising the high performance qualities of ProSeal 777.

b. If a suitable substitute is not available, insure that all workers that mix, apply, or cure ProSeal 777 are aware of its extreme toxicity.

c. Adequate ventilation is essential. All work procedures involving ProSeal 777, including mixing, should be carried on out-of-doors. Local exhaust ventilation should provide average capture velocity of 200 feet per minute and should be used with each operation. A portable exhaust ventilation unit with flexible duct work that would allow the duct inlet to be positioned in such a manner as to capture all vapors should be procured for this work.

d. Appropriate and adequate protective equipment should be available. Where adequate control of vapor can be maintained, the minimum protective equipment needed would be impervious gloves, coveralls, and chemical protective goggles or face shield. (Adequate control of vapor means control to the extent that no vapor can reach the worker's breathing zone.) For application where adequate vapor control cannot be assured, the worker should have a supplied air respirator or a self-contained breathing apparatus.

e. Closure or enclosure of TDI mixing and supply vessels during transport from storage to production area should be required.

f. Materials should be available for decontamination in event of accidental spillage of ProSeal 777. For spills on the skin, the affected area should be washed with 30% isopropyl alcohol and then soap and water. In the event of eye contact, the eyes should be slushed copiously with water for 15 minutes. For small spills on the aircraft, the materials can be wiped up with a rag, being careful to avoid skin contact and inhalation of vapors. For large spills on the ramp an effective decontaminant is a solution of aqueous 5% ammonia containing 10% isopropyl alcohol.

5. It is further recommended that a Maintenance Order be prepared concerning ProSeal 777 to insure that all using organizations be aware of the hazards and precautions involved in the usage of this compound.

6. Check areas that this compound is used in and make sure it is handled properly.

7. A recommended reference on this compound is: Industrial Hygiene and Toxicology (2nd Rev. Ed.), Vol. 2 - Toxicology, Frank A. Patty, Editor, John Wylie & Son, New York, 1963.

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Enclosure 2
to FSNL 3-65

FOR OFFICIAL USE ONLY No. 4-65

Flight Surgeon's NEWSLETTER

(This material is for the information of Navy flight surgeons only and does not necessarily reflect endorsement by the Navy or the Naval Aviation Safety Center.)

A GUIDE TO PROPER NUTRITION

By Jerome A. MOORE, CAPT, MC, USN

Advances in the science of nutrition indicate the importance of proper foods in maintaining good health.

Faulty eating habits lead to obesity, shortened life expectancy, and conditions such as heart disease, hypertension, and diabetes as well as to the degenerative diseases formerly considered incident to "old age."

Insurance statistics show that these diseases occur more frequently among persons who are overweight. Since overweight indicates improper eating habits, and since certain of these appear to be the culprits behind the above conditions, re-education in keeping with new principles of nutrition, points to good preventive medicine.

If your eating pattern has resulted in your overweight, that pattern is as faulty for others in your family, whether or not they are overweight. In this sense, if your extra pounds have inspired you to action, then both you and your family are lucky. Family meals can now be prepared with greater nutritional understanding.

In order to shed your excess pounds, you must limit your daily intake to 1200 calories. With the aid of the enclosed menu suggestion and calorie lists (omitted in FSNL because of space) you will soon learn that careful selection will result in satiety as well as steady weight loss.

Fatty foods or solid fats should be avoided not only because they are loaded with calories but because they lead to hardening of the arteries and coronary heart disease according to recent studies. In eliminating these fatty foods, here are a few suggestions:

1. Stop using cream.
2. Substitute skin milk for whole milk and ice milk for ice cream.
3. Use butter sparingly.
4. Use cheeses made from skim milk (cottage cheese, sap sago cheese, and certain imported Greek and Scandinavian cheeses).
5. Eliminate all fat meats.
6. Skim fat off meat stock before making gravy.
7. Use egg yolk sparingly.
8. Substitute liquid vegetable oils when possible for solid fats.

FOR OFFICIAL USE ONLY

Flight Surgeon's NEWSLETTER

You can expect to lose 10-15 lbs. during the first two weeks and an average of 1½ lbs. per week thereafter. One more hint -- if you eat your meals slowly you will be content with smaller portions, and will not require seconds.

A requisite of this program is that you report in each week at which time your weight and blood pressure will be recorded. At this time if you have any individual problems they can be discussed with the doctor who will follow your progress carefully.

You can easily maintain your ideal level, once it is reached. Now, daily weighing is in order. It will tell you if you are exceeding your daily food requirement, allowing you to adjust your menu as necessary.

--- Introduction to CAPT MOORE's "Reducing Kit"

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Following is the abstract of a study released by the Federal Aviation Agency, Office of Aviation Medicine, Georgetown Clinical Research Institute, Washington, D.C. STUDIES ON AGING IN AVIATION PERSONNEL by Arthur E. Weintz, M.D. Aug. 1964, 12 pp. Report No. AM64-1. (Unclassified)

FAA aviation medical scientists are studying clinical aspects of aging in aviation personnel, Georgetown Clinical Research Institute, Georgetown University Medical Center, Washington, D.C. Investigative work is in the cardiovascular, neurological, pulmonary, vision and auditory, and the biochemical systems. Behavioral tasks are incorporated in the individual survey. Subjects for studies are selected from aviation personnel. Significant numbers for each 10-year age group will be examined annually for buildup of individual profiles. Consecutive studies at the Institute should develop techniques for rating physiological aging in individuals; for evaluating and detecting pathological states at earliest age; and to aid in formulating physical standards by physiological rather than chronological age, in aviation personnel.

#

OCCUPATIONAL HEALTH HAZARDS

The following items are reprinted from the Bureau of Medicine and Surgery's Occupational Health Hazards Release No. 41.

Air Compressors - A heavy duty electrically driven air compressor is installed in a hangar area. When this space was converted for use as a shop office, the occupants complained of excessive noise. Noise levels as high as 105 decibels were observed in spot checks. An integrating type noise level meter was installed and recorded sound levels above 85 db in six hours out of 24. Removal of the motor and compressor to a shelter outside the hangar building was recommended.

Instrument Truck Noise - Sound level measurements were made in a driver's cab of a Navy electronics instrument truck during highway operation. The average overall noise level was 104 db. Since prolonged exposure to this high noise level could be expected to produce adverse effects on hearing, it was recommended that the cab occupants wear ear protection, and that consideration be given to the application of engineering controls to attenuate the noise generated in the motor compartment.

Nonionizing Radiation

AN/SPG-55B - The industrial hygiene division assisted the combat systems division in determining the cut-out cam installation positions on AN/SPG-55B radars aboard a ship. Cams are installed in order that the radar will be de-energized before any occupied area is irradiated at a level above the safe limit.

Double Flash Burn - Two Marine machinists recently reported to the dispensary with symptoms of flash burn. It was found that they had been drilling and tapping holes on the after hatch of a submarine. The job required both of these tasks (welding, boring and tapping) to be carried on simultaneously because of the necessity of sea trials. Both men agreed that to effectively shield the arc would have been inconvenient to not only the welder but to personnel requiring the passageway at various times. They also stated that flash goggles would not have been practical for them because of the precision required to bore and tap the holes. The eye to arc distance was estimated at three feet or less and the exposure time was for about six hours. It was recommended that if this particular set of circumstances should occur at some future date they should immediately notify their supervisor who may either reschedule the work or assure adequate shielding of the welder's arc.

Microwave Hazards of a Mobile Radar Unit - The microwave hazard of a mobile radar unit was evaluated by measuring the field power density in the beam from a radiating stationary antenna. At ground level, microwave radiation was barely detectable from the antenna outward. At about 12 feet above the ground, which is the direct beam, and between 40 and 200 feet from the antenna, the measured field power density was found to be about half ($5mw/cm^2$) of the safe value for continuous exposure. Apparently, the only personnel exposure hazard involves electronics engineers and technicians, who should be alerted to the danger from the radar beam within 40 feet of the stationary antenna.

Microwave Survey - A microwave survey of the tropo communication system of a Navy ship was conducted. All points of measurements were below the hazardous level of $10mw/cm^2$.

Ionizing Radiation

During the routine processing of films, it was observed that one film had an unusually high open-window density. An investigation revealed that after work each day, the individual who used this film had placed his film badge in his pocket together with his watch which contained a radium-painted dial. After further investigation it was concluded that the high open-window density was caused by the radiation emitted by the radium-painted dial.

A radiological survey was made of an AN/UPS-1C radar system in connection with the survey for microwave radiation. Measurements were made with a Ray-D-Tec Radiation Meter, Model ANC-100XL, American Nuclear Corporation, since other available instruments sensitive to the possible x-ray energies present were disturbed by the radio-frequency radiation.

No ionizing radiation was found, either from high-voltage electron tubes or from radioluminescent dials, except a very small zone at about one mr/hr just above the magnetron tube. It is unlikely that anyone would place his hand in this area, even for a short time. No precautions against ionizing radiation need be taken, unless shielding is removed from the magnetron.

A 20 curie cobalt-60 source projector with wheels was being used on scaffolding during industrial radiography at the building ways. While moving the heavy projector into position, it was carried farther than expected because of its inertia, and the trailing cable control handle caught on an edge of the scaffolding. The cable was stretched taut, and the source was pulled out of the rear of the projector, and fell between two planks of the staging. The source was recovered without further incident. It was recommended that the control cables be coiled on the projector during any movement of the latter.

Radiological surveys for radioluminous components were made aboard four ships arriving at the shipyard for repair or overhaul. These surveys are made for the protection of shipyard employees who may work on such items, and to assist the ship in complying with BUSHIPS INSTS 5100.15 and 5100.16.

One DDR had 99 items with radioluminous components, such as telephone jack boxes, rotary switches, liquid level gauges, and radio-receivers. Some items read up to 150 mr/hr at the surface. A DD had 11 items, up to 40 mr/hr at the surface. Two SSG's had 10 items each, up to 80 mr/hr at the surface. The items were tagged, and reports sent to the planning division as well as the respective ship's commanding officer.

#

PEARLS....

1. An MOR is a document that is of prime importance to the U. S. Naval Aviation Safety Program. This document now in the original form along with the AAR receives the attention of all concerned from the originator all the way to the Fleet Commander.

When these documents are not filled out properly they are of decreased value to the chain of command and the U. S. Naval Aviation Safety Center in interpreting what happened at the scene, as well as before and after the accident.

We do not have enough time or personnel to return these documents to the originators for correction so further subjectivity enters into the interpretation of these reports. Please be as explicit and conscientious as possible about completing the MOR. What we learn from the MOR you fill out today could help to save your derriere tomorrow.

2. The Aero-Medical Convention is in New York on 26-29 April. Hope you'll be there.

3. Ron Amalong's "Notes off the Blood Pressure Cuff" is an enclosure to give you guys an idea how one guy does it. If any of you have other or different ideas about "passing the medical word" let us hear about it and we'll carry it.

4. Drs. L. Ballenberger, Robert Mitchell, Wayne Erdbrink, Stu Ragland, Hugh Pratt, Ellyson Conrad, and Bob McTammany have promised articles for this pub. Anyone else care?

5. Will have an article on handling of injury data as planned by all three Services soon.

6. LCDR Hugh PRATT will be going over to School of Aviation Medicine, Pensacola to replace CAPT Robert MITCHELL of 1,000 aviator fame.

#

ENCLOSURE 1

Excerpts from the first two issues of CAG-8's "Notes off the Blood Pressure Cuff," the brain child of LT Ron AMALONG, MC, USN.

notes off the blood pressure cuff

POOPY SUITS

Antiexposure suits are fashionable again this winter. Designed to protect the wearer, these garments receive almost as much verbal abuse as does Wardroom 3. They are required when the water temperature is 59° F. or lower, or when the outside air temperature is 32° F. or lower, or when the combined air/water temperature is 120° F. or lower. The poopy suit can protect its wearer from serious exposure hazards for several hours, even with a 28° F. water temperature and a 40° F. air temperature.

A case in point: A pilot escaped his disabled aircraft in water of about 30° F. He was NOT wearing an antiexposure suit, was picked up in ten minutes, but was already dead from exposure. His passenger, who WAS wearing an anti-exposure suit was picked up an hour later, alive.

A case closer to home: The recent helicopter accident should enforce the need for wearing the poopy suit NOW. These men did wear suits and after only about 25 minutes in the water were very very cold. Warmth would have been enhanced if liners had been worn.

The neck seal should be fastened to prevent the chilly sea from dampening the inside where all-important you reside.

The poopy suit is designed to provide positive buoyancy in water, unless the suit is torn. In cold water fingers quickly lose their dexterity, and the added buoyancy of the suit may be a life-saving aid while attempting to inflate the life preserver. This buoyancy may have been a major factor in keeping one of the HU-2 pilots afloat until the difficulty inflating his Mae West could be overcome.

Some of the flying personnel have not been waiting for the absolute minimum temperature requirements to wear their poopy suits. It seems cold enough to them to wear them and we applaud this good survival sense.

RESPECT IT! PROTECT IT! INSPECT IT! ACCEPT IT!

Enclosure 1
to FSNL 4-65

AERO-OTITIS

Speaking of the "unrest in the Middle Ears"....

Oxygen aero-otitis occurs in flying personnel who breathe 100% oxygen. The "air" in the middle ear gradually becomes 100% oxygen also. On descent from altitude, the middle ear pressure is equalized but there is more oxygen in the middle ear than in the sea level air. After a few hours on the ground the excess oxygen in the middle ear begins to absorb into the tissues and a vacuum results. , , , , Hence, ear pain from an ear block.

The Valsalva maneuver may be required every half hour for several hours after a flight on 100% oxygen to replace the absorbed oxygen with environmental air. After a night hop, it's a good idea to "clear the ears" before going to bed, so that oxygen aero-otitis will not develop during sleep.

OXYGEN MASK CARE

A tiny foreign object can cause non functioning of an oxygen mask exhalation valve. Are you keeping your mask free from debris and having it cleaned regularly?

Caution concerning loose mustache hairs should be observed by one group, eh, you?

* * *

How many washings do you get out of your flight suits before they are too worn to wear? The aeromedics at the Safety Center would like a "census." It'd appreciate a list from each squadron. Advance thanks. Incidently, the fire-proofing in the flight suits last 15 washings.

* * *

A word about the flight physical and what it means. First, the lab tests: Blood is drawn for only one test, the serologic test for syphilis (STS). The urine is checked for protein, sugar, and a centrifuged sample is examined under the microscope. The urine may show evidence of kidney, ureter, or bladder disease. Conditions affecting the body as a whole will sometimes show up first in the urine - sugar diabetes, for example. The chest x-ray can be studied for evidence of present or past lung disease. It also gives an idea as to the condition of the heart, windpipe, diaphragm, upper spine, and ribs. With these three lab tests, we can get a good start on assessing your general health.

Next time: Weight and the Schneider Test.

* * *

Enclosure 1
to FSNL 4-65

EMERGENCY ARTIFICIAL RESPIRATION

During the past few years, mouth-to-mouth breathing has been accepted as the superior method for administering artificial respiration. Previously, the method was considered inadequate; it was reasoned that "used" air from a person's lungs contained less oxygen and more carbon dioxide than room air contained, and therefore could not be useful for artificial respiration.

When some courageous medical researchers completely paralyzed some not-so-courageous "volunteer" medical students and revived them with mouth-to-mouth breathing, they learned that the larger breaths used in mouth-to-mouth breathing actually provided BETTER oxygenation and better carbon dioxide removal than that of a conscious person breathing on his own. By measuring various factors of ventilation it was learned that all the back-pressure, arm-lift, hip tilt, shoulder-twist, toe-twitch methods of artificial respiration were less effective than mouth-to-mouth breathing. With the other manual methods, adequate amounts of air are NOT moved into the lungs of nonbreathing victims; the bending and twisting of the neck completely or partially blocks the passage for air.

Whenever a person is found unconscious from any cause (drowning, electric shock, carbon monoxide poisoning, stroke, etc.) he may not be breathing. Oxygen lack rapidly results in damage to the brain and stops the heart. SO ACT WITHOUT DELAY!!

Untrained personnel can perform mouth-to-mouth breathing successfully IF a few details of technique are observed.

1. Place the victim on his back. If there is foreign matter in the mouth, clean the mouth or throat with your finger or a piece of cloth.

2. Hold the victim's head tilted backward and hold his lower jaw upward, the so-called "sniffing" position. The jaw can be lifted upward so that the lower teeth are higher than the upper teeth by grasping the angles of the lower jaw just below the ear lobes. It can then be held this way by holding the fingers of one hand under the chin at the midline.

What has been accomplished thus far is an open, free, straight airway.

3. Close the victim's nose with your free hand.

4. Take a deep breath, place your mouth over the victim's mouth with airtight contact, and blow. Blow forcefully into adults and gently into children. (If both hands are occupied, your cheek can press against the nose and prevent air leakage through the nostrils.

5. Watch the victim's chest. When the chest rises, stop blowing and remove your mouth from the victim's mouth.

6. Let him exhale passively with the elasticity of his lungs and chest.

7. If the chest does not rise, improve the airway (clear the mouth, increase jaw support, position head better, blow more forcefully).

Enclosure 1
to FSNL 4-65

8. Repeat the breaths 12 to 20 times per minute.

In brief:
POSITION ON BACK
CLEAR MOUTH
HEAD BACK
CHIN UP
PINCH NOSE
SEAL MOUTH TO MOUTH
BLOW

If you would like a demonstration at an AOM or at a division meeting, we'll be pleased to provide same.

* * * * *

NIGHT VISION

Good night vision requires adaptation. The rods in the eye must build up visual purple and this takes about 30 to 4 minutes of darkness or red-light adaption. The result: the rods can then detect a light about 10,000 times dimmer than when the eye is light adapted. The reason that red light is used is that the red color of the visual spectrum has a long wave length that is not absorbed by visual purple. (Visual purple is also called rhodopsin and is a protein pigment which is closely related to Vitamin A).

Fatigue, alcohol, Vitamin A deficiency, and excess smoking can reduce night vision. Any sudden exposure to bright light will nullify adaptation. Keep screaming about the white lights which glow along your trail from the Ready Room to the Flight Deck. I have a can of red paint.

* * * * *

SCRAPS FROM THE SCALPEL

The "P" in APC's can cause damage to the kidneys when used in large amounts or for a long period of time. The Food and Drug Administration now requires a warning label for APC's. Chronic use of APC's should be especially avoided by aviation personnel because hypoxia and other adverse effects may occur. The ingredients of APC's are good drugs but as with any drug, must be used judiciously. How many bottles of 1000 have been gulped in your Ready Room since the start of the cruise? Make the flight surgeons your O-in-C's of APC's!

* * * * *

Walking is a "best" exercise. How far is a mile hike? 5.08 times the length of the flight deck! 40.6 trips up to PRI FLY! 264 times across your stateroom!

* * * * *

ENCLOSURE 2

2ND MARINE AIRCRAFT WING, FMFLANT
U. S. MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA 28533

18 August 1964

From: Staff Medical Officer, 2d MAW
To: Flight Surgeons, 2d MAW

Subj: Operational Aviation Medicine and Survival Training

Ref: (a) 2d MAW Order 3500.15
(b) OPNAVINST 3740.3
(c) COMNAVAIRLANT INST 3740.11
(d) MCO P1500.12

Encl: (1) Flight Surgeon's Syllabus
(2) Motion Picture List
(3) Publications List

INTRODUCTION:

Win: Order 3500.15 of 3 February 1964 established the Operational Aviation Medicine and Survival Program in the 2d MAW, complying with OPNAVINST 3740.3, COMNAVAIRLANT INST. 3740.11 and MCO P1500.12.

MISSION:

The program represents an effort to coordinate and supervise training for flying personnel within the 2d MAW in areas of aviation physiology, human engineering, operational aeromedical considerations, emergency egress from aircraft, underwater oxygen breathing, survival techniques, and escape and evasion methods in order to assist squadron commands in carrying out their responsibilities in these areas.

The Operational Aviation Medicine and Survival Program is coordinated and conducted by the 2d MAW Staff Medical Officer under the overall cognizance of the Assistant Chief of Staff, G-3.

Active continuing participation of Flight Surgeons, Safety Officers, Survival Officers, and Flight Equipment Officers in conducting various phases of the program will not only reflect command responsibilities, but insure the high level of proficiency required by these officers in supervising independent programs at the group or squadron level in garrison or while deployed. Assistance will be rendered by Operations and Air Intelligence Officers in matters of pertinence.

Where possible, direct relationship relating to human factors as applied to aviation flight safety will be emphasized as part of the continuing effort to achieve and maintain accident free flight operations within the Wing.

The subject program at MCAS Cherry Point, N.C., will be made available to commanders of units based at MCAF New River, N.C., and personnel will be scheduled for training as required. Because of considerations imposed by distance, a program will soon be established at MCAS Beaufort, S.C., similar to that at MCAS Cherry Point, duplicating key personnel and program material as necessary.

ORGANIZATION:

The Operational Aviation Medicine and Survival Program (or Survival Training) is known locally as OAMAST. It has three sections: Aviation Medicine, Survival Training and Aviation Physiology. Each section is currently under the supervision of the following officer:

LT J. A. WALSH, MC, USNR----------Aviation Medicine,
CAPT J. W. HEMINGWAY, USMC----------Survival Training,
CDR L. B. COCHRAN, MSC, USN----------Aviation Physiology.

The first two sections are located in ATAU (Station Training Bldg #39), room 101. The Aviation Physiology section is located at the Low Pressure Chamber.

Flight surgeons, while concerned with the problems of survival and physiology, will essentially be responsible only for the material in the Aviation Medicine section. Interest by the individual flight surgeon in the other sections is encouraged.

OAMAST TRAINING PROGRAM (PROPOSED):

Phase I: The "Summer" phase, lasting 3 to 5 days.

A. Water survival - includes harness drop tower, parachute drag, Dilbert Dunker, and swimming test.

B. Low pressure chamber indoctrination.

C. Flight profile lectures and discussions in aviation medicine, panel discussion to include squadron flight surgeon, flight equipment officer and NATOPS officer.

Phase II: The "Winter" phase, lasting 3 to 5 days.

A. Land survival - includes movies, demonstrations, survival trip, and escape-and-evasion indoctrination.

B. Primitive or Basic Medicine - includes first aid, health and hygiene in the field, and dietary requirements in survival situation.

Phase III: A continuing syllabus presented through the year by the squadron flight surgeon. The ideal time is considered to be two hours per month, preferably two 1-hour periods at which all the squadron air-crewmen are present. The syllabus consists of 24 lectures and/or movies dealing with aviation medicine topics.

A prototype Phase III syllabus is (attached).

The reason for a syllabus is the fact that there are no existing guidelines to aid the squadron flight surgeon in the performance of his job. The topics suggested are basic. You are at liberty to add others that may be more appropriate for your particular squadron. As you will note, the material may be presented as movies, lectures or as demonstration material. A list of suitable motion pictures is (attached). A list of publications available is (attached). A comprehensive supply of training aid materials is maintained by OAMAST, also.

In addition, plans are underway to provide each flight surgeon with the means to do his job more effectively. Included in this will be:

(a) Desk space in the squadron.

(b) A bulletin board in the squadron.

(c) Supplementary material and visual aids to be used on the bulletin board.

(d) Training Progress Boards to be used to chart the advancement of squadron personnel through the syllabus.

(e) Biographical Data Cards - to record the pertinent personal, physical and psychological data of flying personnel in your unit.

You are encouraged to use any or all of the OAMAST facilities for your squadron program. All of the OAMAST personnel stand ready to assist you.

SIDNEY I. BRODY
CAPT, MC, USN

Enclosure 2
to FSNL 4-65

FLIGHT SURGEON SYLLABUS (SAMPLE)

January	Illness and the Aviator - lecture Drugs and the Aviator - lecture
February	Accelerative Forces - lecture Movie: "G" FACTS MV-8379 (29 min.), color
March	Vision: day and night - lecture Movie: THE SENSE OF SIGHT MN-9480 A (35 min.), color
April	Tobacco - lecture Exercise - lecture
May	Human Engineering - lecture First aid - lecture or movie
June	Fatigue and Rest - lecture Coffee
July	Oxygen, Hypoxia - lecture Pressure Breathing, Hyperventilation. Also movie: HUFF AND PUFF MN-9517 (8 min.), color
August	Heat Stress Movie: PREVENTION OF HEAT CASUALTIES MN-8965 (25 min.)
September	Dysbarism and Pressure Equipment (suits and cabins)
October	Disorientation, Vertigo and Motion Sickness Movie: ILLUSIONS MN-9480 B (35 min.), color
November	Cold Weather Stresses - lecture Movie: ANTI-EXPOSURE SUIT - MK IV MN-7458 B (16 min.) - MK V MN-9549 (15 min.)
December	Diet and Obesity Alcohol

OTHER TOPICS:

Physiology of Hearing; hearing loss prevention
First Aid Kits
-Individual (Field kit)
-Pilot's Personal (Morphine included)
-Aeronautical kit (for Aircraft)
The Solar Still
Desalting kits
Personal Clothing and Survival Equipment
PSK-2 kit
SEEK-1 kit
Snake bite kit
The Flight Surgeon
Toxicology in Aviation

Enclosure 2
to FSNL 4-65

MOTION PICTURES

Movies are available either at ATAU, Bldg. 39 Film Library or at the Aviation Physiology Training Unit (*).

Movie projectors, slide projectors and tape recorders are available at ATAU Film Library. In addition, there is a film-previewing room at the Film Library, which you are free to use at any time during the working day.

A partial list of appropriate films:

MN-7458B Mark IV Aviator's Anti-exposure Suit (16 min.)
*MN-8323A Mark IV Full-pressure Suit
*MN-8364A Aviation Survival and Equipment - Liquid Oxygen Converters (14 min.)
MN-8379 "G" Facts (29 min.)
MA-8540B Everyday Emergencies
MV-8677 Sun, Sand, and Survival (23 min.)
MN-8760A Helicopter Rescue at Sea (22 min.)
MA-8851 Prevention of Cold Injuries (20 min.)
MC-8863 The Navy's Blue Angels
MN-8965 Prevention of Heat Casualties (25 min.)
MN-9318 Medical Aspects of High-intensity Noise
(a) General Effects (22 min.)
(b) Ear Defense (23 min.)
*MN-9380 The Sense of Sight
(a) Vision in Military Aviation (35 min.)
(b) Illusions (35 min.)
*MN-9517 Huff and Puff (8 min.)
MN-9549 Mark V Aviator's Anti-exposure Suit
*MV-9604 Spatial Disorientation in Operational Flight (20 min.)
MB-9690 First Aid for Aircrew (27 min.)

PUBLICATIONS

A fairly good aviation medicine and survival library, along with prepared lectures in many topics, is in existence in Room 101, ATAU, Bldg. #39. There is also a classroom and a demonstration room adjacent to Room 101 at your disposal.

PUBLICATIONS AVAILABLE AS OF 9/1/64

Aerospace Medicine - Aerospace Medical Association Monthly Journal
Aircraft Accident Investigators' Handbook (NAVWEPS 00-80T-67)
Aircraft Manuals:
A4 Flight, Maintenance and NATOPS (NAVWEPS 01-40AVB)
A6 Flight, Maintenance and NATOPS (NAVWEPS 01-85 ADA)
A4 Flight, Maintenance and NATOPS (NAVWEPS 01-245-FDB)
F6 NATOPS
F8 Flight, Maintenance and NATOPS (NAVWEPS 01-85 HHD)
Approach (copies from 1957 to present)

Arctic, Desert, Tropic Information Center Publications
- ADTIC 6102 Terrain & Climate of Korea and Adjacent Lands
- ADTIC A104A&B Project Mint Julep (Investigation of Greenland Ice Cap in 1953)
- ADTIC D-101 Climate and Weather in the Central Gobi of Mongolia
- ADTIC D-104 The Desert Survival Field Test
- ADTIC D-102 Sun-Sand and Survival
- ADTIC D-100 Afoot in the Desert
- ADTIC A-103 Down in the North
- ADTIC G-110 An Annotated Bibliography of Basic Survival, Combat Survival and Counterinsurgency
- ADTIC G-111 Survival on Film (Instructor's Guide to Survival Training Films)
- ADTIC G-104 Airmen Against the Sea
- ADTIC T-101 The Jungle Survival Field Tests
- ADTIC T-100 999 (Survival Experiences in the Southwest Pacific)

Armstrong, H. G. Aerospace Medicine, Williams & Wilkins, 1961
Aviation Medical Safety Training Manual (2) (NAVAER 00-80T-89)
BUWEPS Aviation Clothing and Survival Equipment Bulletins (BACASE B:2)
Crossfeed Series
- General
- Escape
- Personal/Survival Equipment
- Cockpit
- Maintenance

Ejection publications (includes RAPEC)
Flight Surgeon's Manual (USAF Manual 161-1)
Flight Surgeon's Newsletter
High Speed Flight Information for Pilots (NAVEXOS P-960)
Hot Dope Sheets (2d MAW Safety Magazine)
Interceptor (USAF ADC Safety Magazine)
Martin-Baker Seat
Naval Aviation Biophysics and Survival Equipment Publications Index (NABSEP)
Naval Aviation News
Parachute and Oxygen Publications
Safety and Survival Equipment (NAVAER 00-80T-52)
SENSE Pamphlets (NAVAER 00-80Q series)
Survival Training Guide (NAVWEPS 00-80T-56)
U. S. Navy Aircraft Firefighting and Rescue Manual (NAVWEPS 00-80R-14)
Weekly Summary (from Naval Aviation Safety Center)
Your Body in Flight (AFP 160-10-3)

FOR OFFICIAL USE ONLY No. 5-65

Flight Surgeon's NEWSLETTER

(This material is for the information of Navy flight surgeons only and does not necessarily reflect endorsement by the Navy or the Naval Aviation Safety Center.)

IMPORTANCE OF ACCELERATION FORCES IN PRODUCING ACCIDENTS

(The following article by LT P. B. NEDELMAN, MC, USN, senior medical officer at NAS, South Weymouth, Mass., is the latest in his hand-out series, "Notes From Sick Bay." Here's a ready-made beginning for your next squadron lecture on G-forces and the protection offered by the anti-G suit.)

Flight in high speed naval aircraft routinely subjects the pilot to severe accelerations and decelerations. When exposed to such forces the human body undergoes many changes ranging from a complete collapse of the circulatory system to a simple increase in the fatiguing characteristics of flight. Related to the physiological changes produced by these stresses are corresponding changes in the performance capabilities of the pilot. For example, it has been reported that in certain protective clothing under a high level of acceleration the pilot may not be able to activate the escape mechanisms in the aircraft. Too abrupt a pull-out from a high speed dive can cause a pilot to lose his sense of vision or even lose consciousness. Visual illusions of considerable magnitude can also be produced.

It is apparent that man is ill-equipped to withstand severe acceleration stresses. It is also apparent that in military flying such stresses will increase as the performance characteristics of aircraft increase. Therefore, flight personnel must understand these forces and factors which can both increase and decrease tolerance to them. Without such an understanding, both on the part of the flight surgeon and the pilot, many avoidable accidents will continue to take place and the number of entries in the "cause undetermined" accident category will continue to increase.

The measurement of acceleration is in terms of G forces, the acceleration of gravity, or 32 feet per second per second.

There are three basic types of acceleration forces. These are:

1. Linear Acceleration: Linear acceleration used generically is defined as a progressive increase or decrease in velocity along a straight line. Linear acceleration in aircraft occurs primarily on take-off and landing. Naval aviation encounters more severe stresses in linear acceleration than do other modes of flying. For example, catapult launchings and carrier deck landings or crash landings and ditchings on water surfaces provide severe linear accelerations and decelerations. A high-speed carrier arrestment may exceed 6 G's.

2. Radial Acceleration: Radial acceleration involves a change in direction but not necessarily any change in rate or velocity of travel. Radial acceleration forces are produced by centrifugal force tending to cause an object to remain in the same direction of motion upon the application of other forces causing

it to change direction. Since the magnitude of radial acceleration forces is proportional to the square of the velocity and inversely proportional to the radius of the turn, it follows that as the speed of new aircraft continues to increase, radial acceleration forces must also increase. It is not feasible to increase the radii of turns to such an extent as would be necessary to maintain low level radial G forces. However, the aerodynamic characteristics of modern aircraft impose certain limitations. At 40,000 feet a jet cannot pull high-G turns without encountering buffet, a form of stall. In supersonic flight higher G turns can be made but deceleration occurs which results in the plane becoming subsonic and again encountering strong buffet.

Radial acceleration forces are also classified in terms of their action upon the human body. The classification may be divided into two principal types depending upon the direction of the force with respect to the three axes of the body.

A. Longitudinal (vertical)

(1) Head to feet (positive acceleration)
(2) Feet to head (negative acceleration)

B. Transverse

(1) Sagittal (antero-posterior, postero-anterior)
(2) Lateral (left to right, right to left)

3. Angular Acceleration: Angular acceleration involves both a change in velocity and a change in direction. This is the type of acceleration force found in spins of certain aircraft. This type of acceleration, involving as it does a combination of velocity change and direction change, is particularly dangerous in terms of vestibular stimulation and violent disorientation produced.

Influence of G Forces on the Cardio-Vascular System

The most obvious effect of a positive acceleration force is in the increased weight of all parts of the body. For example, at four G's a 200 pound man effectively weighs 800 pounds. This same relationship exists internally. The weight of the normal blood volume is also increased by a factor of four. The circulatory system, being maintained by a series of elastic tubing, depends for its normal function upon well-defined pressure. Excessive gravitational stressing of this system causes gross disturbances in the local distribution of blood volumes and in the pressures at which the blood operates. Most of the concomitant physiological and performance degradations undergone during periods of gravitational stress are a function of basic changes within the cardio-vascular system.

Acceleration stresses produce the greatest pressures in those parts of the system that are farthest from the heart. Man is so constructed that when he is seated his heart lies approximately at the point of junction of the upper and middle thirds of a long cylindrical body. The head, which is the structure most sensitive to deficiencies in pressure, is located at one end of this cylinder and is approximately 30 centimeters from the heart. Normal peak arterial pressure is equal to 120mm Hg. At 5 G's, a standing blood column of 30 centimeters exerts a pressure of 120mm Hg., thus exactly balancing arterial pressure. Under such circumstances either compensatory reflex mechanisms must come into play or blood flow through cranial arteries will cease. Evidence indicates that within certain limits reflex mechanisms do compensate for these pressure differentials.

The ability of a pilot to sustain consciousness beyond the point at which it would normally be expected to fail appears to be a function of the constriction of the venous system. During high positive acceleration forces, the internal jugular veins and the veins in the sinuses of the head tend to collapse. The longitudinal venous plexus, however, being incased in a pressure tight bony cage, will continue to transfer blood. This, plus the fact that considerable cerebral vasodilatation also occurs, may account for the increase in tolerance to positive acceleration over that expected in terms of normal arterial pressure.

Since tolerance to positive acceleration forces is in part a function of the height of the blood column between the heart and the head, it follows that changes in posture which reduce the length of this column or its effective height will increase tolerance to G forces. For instance, tolerance to acceleration can be increased by having the head of the pilot moved forward so that he is in a semi-crouch position. This reduces the vertical distance through which the blood must travel against gravity to get to the cranial area.

During negative acceleration when the force operates in a foot to head direction, high cranial pressures will develop which may be sufficient to rupture thin walled capillaries. This, in addition to the fact that body reflex mechanisms apparently are not as efficient for negative accelerations, greatly reduces tolerance to this type of stress. It is reported that during negative acceleration vision may "red-out." This condition would presumably be a function of the rupturing of small capillaries in retinal and surrounding areas. No evidence of this condition has occurred during experimental work and it is thought instead that, in aircraft, vision may be obscured by the forcing of the lower eyelid over the cornea by the high G forces. The muscles for this lid are weak and not designed to hold it in place against the force of negative gravity. Retinal hemorrhages have never been observed in man during experimental exposures to negative acceleration.

An additional effect of acceleration forces, particularly positive acceleration, is that of tissue fluid accumulation and the pooling of blood in the abdominal veins and those of the lower extremities. Effective protection against G forces must include a means of preventing such blood pooling in the abdominal and limb regions.

TRICHLOROETHYLENE AND ACETONE

Containment tents are used to prevent the spread of contamination during work on radioactive materials. Dye penetrant checking of weldments and welding may take place within these tents. Certain of the dye penetrant processes utilize trichloroethylene for cleaning operations. If trichlorethylene vapor is present during welding operations, phosgene and hydrogen chloride may be formed with damage to personnel and equipment. It has been recommended that acetone be used in place of trichloroethylene for this purpose. The industrial hygiene division conducted an investigation comparing the hazardous qualities of the two materials. An actual work situation was set up and exposures to trichloroethylene and acetone were evaluated. During the test, the containment tent was ventilated by a four inch diameter flexible exhaust furnishing approximately 28 air changes per minute. Trichloroethylene rapidly built up to concentrations of two or three times the recommended threshold limit value of 100 p.p.m. each time it was applied. Residual quantities of trichloroethylene, even in small amounts, may cause hazardous concentrations of thermal decomposition products when welding takes place after the cleaning operation. On the other hand, acetone did not exceed the threshold limit value of 1000 p.p.m. at any time. Since the lower explosive limit is 2.55%, this concentration was never reached. Excessive concentrations of acetone have adequate warning properties because of upper respiratory and eye irritation. Thermal decomposition products are not toxic. Therefore, it was recommended that acetone be used in place of trichloroethylene.

--- Occupational Health Hazards No. 41

#

CASE OF SUSPECTED CO CONCENTRATION

The following report was recently submitted as required by BUMEDINST 6510.4A of 29 March 1962:

"A student pilot took off in an AlH type aircraft on an E-2 syllabus hop. After routine preflight taxi and engine run-up (both the latter with closed canopy) student took off for a regular E-2 syllabus hop of tactical and acrobatics. He smelled exhaust fumes during first rendezvous shortly after takeoff and then again during the initial climb to altitude as he opened the vents and turned on heater, (both these times only momentarily).

"During the various acrobatic maneuvers, the student would catch a fleeting whiff of fumes, the first being at approximately 0940. This continued until about 20 minutes prior to touchdown at home field at 1105.

"He had a dull ache at the left costal margin for about an hour, but at no time did he have other symptoms nor was his flying erratic or his radio transmission garbled. He flew a maximum altitude of 10,000 feet. Settings of

heating systems were low and venting systems were on. He is a non-smoker. Source of contamination is unknown. Canopy was closed during routine engine runup. Cockpit test was negative. Blood was drawn at 1115. The carbon monoxide was reported at 10% saturation."

How about checking your aviators when they complain of symptoms that might indicate CO poisoning?

#

DISPOSAL OF TETRACHLORETHANE

The disposal superintendent inquired about the disposal of ten 5-gallon cans of tetrachloroethane which he had received from passive defense. The cans of tetrachloroethane contained a decontaminant used in chemical warfare defense. It is known as DANC Solution. BuDocks had advised all activities to dispose of all cans of this item because of interior rusting. Tetrachloroethane is one of the most toxic of all chlorinated hydrocarbon solvents with a threshold limit of 5 p.p.m. Skin contact and inhalation must be avoided. The disposal superintendent was advised of the hazards of handling tetrachloroethane and it was recommended that the 10 cans be stored outdoors with a tarpaulin over them. The preferred method of disposal per BuDocks Instruction is far at sea. Another method which is not adaptable in this shipyard is to pour it into the ground, where there is no habitation up to one mile downwind and one half mile upwind. The third method, which was the one used, is to dispose of it via a commercial disposal company.

--- Occupational Health Hazards No. 41

#

PEARLS....

1. A recent note from CAPT Tony RUSH calls our attention to the four new aviation training films on vision. One is on General Vision and the others on Visual Illusions, Inflight Closure and Recognition, and Fallacies of Vision. These movies were made in 1963 and 64 and are up to date. They are in the MN series. Good for use in connection with lectures.

2. Look for an FSNL article soon on blood sugar and blood alcohol.

3. Congratulations to all your hospital corpsmen on the 67th Anniversary of the Hospital Corps 16 June.

4. An article worth looking up in preparation for your fall lectures is "Cold, Disturbances Due to" by CAPT E. E. HEDBLOM in Current Therapy, Conn. Saunders, 1965.

#

ENCLOSURE 1

CRASH COMMUNICATIONS QUESTIONNAIRE

Your answers to and general comments on the following questions will help us in an informal survey on crash communications. Just fold and staple the sheet and drop in your OUT basket. We know that there are 450 flight surgeons. We expect 450 replies!

Have you ever been in a crash situation where radio communication equipment installed in the ambulance providing direct communications with rescue aircraft, control tower, and crash crew would have benefited? _____

Hindered? _____

Prevented an accident? _____

Do you have radio equipment today in your ambulances and crash trucks? _____

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FOR OFFICIAL USE ONLY

No. 6-65

Flight Surgeons NEWSLETTER

(This material is for the information of Navy flight surgeons only and does not necessarily reflect endorsement by the Navy or the Naval Aviation Safety Center).

FLIGHT DECK SAFETY PHYSICAL EXAMINATIONS

By LT Robert McTAMMANY, MC, USN, NAS Dispensary, Norfolk

Approximately six months ago, VAW-12 initiated a program of performing a brief examination on all enlisted men checking into the squadron to screen them for any defects which would make working on the flight decks of carriers hazardous to themselves or others. The examination consists of several different parts:

1. Inquiring about the presence of any symptoms at the time of the examination.

2. Inquiring about any significant medical history with specific emphasis on visual or hearing disturbance, seizures or loss of consciousness, mental illness, and any serious illness or injury.

3. Review of the Health Record and Sick Call Record for any pertinent medical information.

4. Physical examination including general inspection, pulse and blood pressure, visual acuity, audiogram, general EENT examination including a confrontation check of peripheral vision, general examination of heart and lungs, and any additional items indicated by the history or screening examination.

5. An informal discussion of the nature of duty on the flight deck and the hazards encountered there.

A decision is then made whether or not the individual is safe for duty on a flight deck. If so, he is given an "up-chit" which is taken to the safety officer who insures that only approved men are allowed on the flight deck. If not, specific therapeutic, diagnostic or dispositional measures are undertaken and the safety officer is so informed by a "down-chit." In all cases a form (see below) is filled out and placed in the health record noting all findings and recommendations.

The program has been highly successful. One hundred fifty-two examinations have been done and six "down-chits" have been issued. Two men were found to have moderately severe myopia, unknown to themselves, which required corrective lenses. Two men were found to have defective peripheral vision and further studies are in progress. One man was found to have a severe anxiety neurosis and another, discovered to have undiagnosed petit mal epilepsy. Many men were found to have less serious problems, such as defective hearing or minor illness, and in each case, preventive or therapeutic measures were undertaken.

Any one of the six men with serious defects, if put on a flight deck, would have been "an accident waiting to happen." The value of finding and treating such cases is obvious. Handling the more minor defects is similarly beneficial. All of those examined were impressed with the interest shown in their safety. This teaching and morale factor is felt to be significant, as well as the examinations themselves.

It is felt, on the basis of this brief experience, that such a program is adaptable for use in any command and that it has great potential value in the prevention of accidents on the flight deck.

The following is "run off" locally on Standard Form 600, Chronological Record of Medical Care:

FLIGHT DECK SAFETY EXAMINATION

Present Symptoms:

Past Medical History:

Visual Disturbance -
Hearing Difficulty -
Loss of Consciousness -
Mental Illness -
Seizures -
Other Illnesses -

Review of Health Record:

Physical Examination:

Visual Acuity - O. D. 20/ O. S. 20/

Audiogram

	250	500	1000	2000	3000	4000	6000	8000
R								
L								

General Examination:

Impression:

Recommendation:

CHEMICAL HEALTH HAZARDS AND THEIR CONTROL: INHALATION HAZARDS DUE TO VAPORS, FUMES, MISTS, GASES AND DUSTS (From Occupational Health Hazards No. 42)

Ammonia - Inhalation of ammonia from an unlabeled bottle containing ammonium hydroxide was responsible for the unconsciousness of a plumber. He opened the jar planning to put some water in it. After inhaling the gas, he passed out. He was given medical attention and released to duty two hours after the incident. This exposure occurred in spite of the fact that the station instruction on the Uniform Labeling Program for hazardous chemicals and materials had been stressed at all safety meetings.

Butyl Alcohol - A telephone call was received from the sick bay of a carrier in the shipyard undergoing overhaul. A number of service personnel had been observed exhibiting various stages of narcosis while painting a head with Formula 117, Spec. MIL-P-15328B.

Formula 117 contains butyl alcohol and isopropanol as well as some phosphoric acid. The hospital corpsman aboard the carrier was informed of the content of the paint vehicle. He later stated that exposed personnel had had a headache the next morning but appeared otherwise to be fully recovered. Arrangements were made to provide adequate ventilation for future operations by ships' force personnel.

Carbon Monoxide - Carbon monoxide levels reaching 200 parts per million (ppm) were found in the closed cab of a gasoline-operated mule. The carbon monoxide tests were conducted after receiving complaints from the vehicle operator that exhaust fumes within the cab were bothersome. It was recommended that the vehicle be examined for exhaust gas leakage into the cab.

Carbon Monoxide - A workman assigned to operate a gasoline powered stacker in a long prefabricated metal building, with no ventilation except through one ten foot door, reported that he frequently experienced headaches while working in that area. Carbon monoxide measurements revealed levels from 75-200 ppm throughout the building 15 minutes after operation of the stacker. There was virtually no vertical movement of air in this building and the direction of flow was horizontal toward the open end at approximately 30 feet per minute. It was recommended that either (1) an electric stacker be provided or (2) exhaust ventilation be installed in the building. Subsequently it was reported that an electric stacker has been assigned to this job.

Decomposition of Chlorinated Hydrocarbon - A request was received for immediate investigation of atypical acrid fumes being emitted from the exhaust of a ship's auxiliary power engines. It was found that, while an enlisted man was cleaning the generator end of a diesel power unit with a proprietary material, containing 1,1,1 trichloroethane in the auxiliary engine room, a diesel power unit was also in operation in the same space. No local exhaust was used to control the vapors of the very volatile solvent cleaner. Air, contaminated with 1,1,1-trichloroethane, was drawn into the air intake of the diesel engine, and thermally decomposed into highly irritating chloride gases which were then exhausted onto an adjoining pier.

It was recommended that the area of application of the 1,1,1-trichloroethane be locally exhausted to capture the vapor and convey it to outside air.

#

PEARLS...

1. Incident Reports - Near misses, etc., from a medical standpoint are important. Only in knowing about the close ones can we hope to plan to avoid a catastrophic actuality. An example: A flight surgeon was recently riding in the right hand seat in the cockpit of a helicopter and leaned forward to look out of the open hatch. The seat belt became separated and he almost fell out. He assumed he had caught the sleeve of his flight suit in the latch and the segments parted normally. He reinserted the male segment into the female and proceeded to once again look out of the hatch leaning quite hard into the belt. Yep! - he almost fell out again. The cause was the belt buckle and latch Series FDC-1650. Well... he reported this and sure enough, the series is faulty and BUWEPS has come out with a change and instruction and we have avoided an accident that could have occurred at any time. Our hats off to Dr. Paul Bedell, flight surgeon at Ellyson Field, for this contribution.

2. Another word: If at any time you feel in an MOR someone should be praised for meritorious action or effort, do so in your summary and recommendations. A better place would be in the recommendations of the AAR if acceptable by the board. If the board declines, you may feel free to comment in the MOR as stated previously, in the summary and recommendations.

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FROM THE NASC AERO-MEDICAL DEPARTMENT SAFETY AND SURVIVAL DIVISION...

This is Safety and Survival Division of the Aero-Medical Department calling for HELP!! We read your MOR's too - as a matter of fact, a large share of the problems you flight surgeons report become our specific headaches! By the same token the vacuums in your reports cause just as many headaches! For instance:

1. How can we put out the word on the effectiveness of helmet and oxygen mask restraints if you don't tell us what type helmet and what type restraints the man had? The Aerospace Crew Equipment Laboratory of the Naval Air Engineering Center needs to know in order to improve headgear and retention features.

2. How can we say that a survivor locator radio or beacon or whatever is no good if you let us believe that the boys who are ejecting don't have any survival radios? We had 211 ejections during the period 1 July 1963 through CY 1964. In ONE HUNDRED FORTY FIVE of these you did not report the presence of a survival radio! The people responsible for developing a reliable radio beacon need to know!

A big portion of our business is to give all these R & D agencies the performance figures on personal and survival gear - but it's up to the flight surgeons to give us the information we must have to compile and to analyze the history of these items. You may think that, in many cases, what a man wears or is carrying is Not Applicable (N.A.) and you indicate this all too often in your reports - but it is very much APPLICABLE. True, OPNAVINST 3750.6E (Section K, p. 10, para. 12.a.) is a bit ambiguous in that it requires a list of equipment "involved" in the mishap. We want a list of <u>all</u> clothing and equipment worn or carried, as well as an explanation of why required items were not available (see para. 12.d., same page). In any ejection, the emergency beacon is certainly "involved" and its presence, absence and performance should be reported. This has been brought out in the past in Flight Surgeon Newsletter issues of 3-64 and 11-64.

We need to know the <u>total exposure</u> to come up with reliable figures and percentages on problems and failures - no more N.A.'s, please?

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Flight Surgeon's NEWSLETTER

(This material is for the information of Navy flight surgeons only and does not necessarily reflect endorsement by the Navy or the Naval Aviation Safety Center).

A RECURRING ACCIDENT PATTERN . . .

We have had occasion to ponder over a particular group of MOR-narratives that are sufficiently similar, one to another, to underscore the fact of the existence of a recurring accident pattern. With minor variations the basic theme has been repeated enough times to demonstrate that we are dealing -- not with rare, isolated events -- but with a very real problem which underlies the occurrence of several aviation mishaps yearly. This issue will have to be faced squarely if we are to eliminate a significant category of losses of men and aircraft arising from unmistakable human error. It seems to us (perhaps from a position like that of a Monday Morning Quarterback) that these losses should be 100 percent preventable! Some verbatim excerpts (except for the pilot's name) from an MOR provide an all-too-typical illustration:

> "And what of LT DOE's activities in the 48 hours preceding. . .? On Saturday. . .he began drinking about noon, consumed 6 beers, and then decided, and I quote, 'to break the record for the most drinks in one night.' He proceeded to consume thirty-four (34) alcoholic mixed drinks. . . He slept 5 hours Sunday morning, drank an undetermined amount of beer Sunday and Sunday night, and slept 6 hours Sunday night. LT DOE's reaction to this weekend was that he 'felt great' Monday morning.
>
> "So we have in LT DOE an immature, irresponsible young man who has until now successfully manipulated his environment to attain positions of responsibility and prestige for which he seems neither socially nor emotionally prepared. Perhaps LT DOE could have been a good pilot. I doubt that he could have been a good officer."

DOE completed high school with slightly better than average grades. As an aviation cadet he was about average throughout the program both in academic studies and in flight training. DOE's marriage was in trouble after only 6 months; an extra-marital affair on DOE's part contributed further stresses and a divorce was pending. In addition DOE had accumulated debts far exceeding a full year of his take-home pay.

> "He has no realistic plans for paying off these debts and acts quite unimpressed by their size. He has persistently bounced checks for insufficient funds. . .already deeply in debt he borrowed more to purchase a sports car. . . One significant item, partly substantiated, is that his average monthly charged bar bill ran in excess of $100.00."

Under the heading "PERSONALITY DISORDERS; SOCIOPATHIC PERSONALITY DISTURBANCES," The Merck Manual (Ninth Edition) has this to say:

> Individuals in this category are ill primarily in terms of conformity with the prevailing cultural milieu, as well as terms of personal discomfort and relations with others. Sociopathic reactions are often symptomatic of severe neurosis or psychosis, or result from organic brain injury or disease.
>
> Antisocial reaction: This term refers to individuals who are always in trouble, profiting neither from experience nor punishment, and maintaining no real loyalties to any person, group, or code. They are frequently callous and hedonistic, showing marked emotional immaturity. They lack judgment and a sense of responsibility but can rationalize their behavior so that it appears reasonable and justified. The term includes cases previously classified as "constitutional psychopathic state" and "psychopathic personality."

Nothing is to be gained, as of this date, by debating whether or not LT DOE should have been singled out in particular and labeled a "sociopath." Nevertheless, it is fairly generally acknowledged that victims of this form of mental disease are occasionally to be found among military aviators, especially the very young. Obviously, they are exceptional cases and, therefore, comparatively infrequent. But the question still remains as to whether we are really doing all that can be done to eliminate this seemingly needless handicap from Navy and Marine Aviation. Your comments and recommendations as to workable ways and means for forestalling future losses caused by emotionally immature operators of our military aircraft are most earnestly invited.

--- G. T. LODGE, Ph.D.
Head, Human Factors Division

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TO BLEED OR NOT TO BLEED

(Here's an item written by LT N. J. VINCENT, MC, USNR, which could be used in one of your All Pilots' Meetings.)

Recently at NAAS "X" a practice bomb exploded during installation on an A-1 aircraft. The bomb did extensive damage to the ordnanceman's upper arm causing a large amount of acute bleeding. A tourniquet was applied immediately but incorrectly causing increased blood loss. Tried and true is the tourniquet to stop bleeding on an extremity; or is it? True, a tourniquet will stop bleeding but to do so it must be extremely tight. For a tourniquet to be effective it must occlude arterial bleeding (140 mm Hg pressure or more). If the tourniquet is less than that, it actually promotes blood loss by allowing blood to flow through the arteries into the arm but preventing the blood return through the veins (less than 20 mm Hg pressure). Where does the blood go then? You guessed it, onto the deck.

Almost all bleeding sites, even large ones can be controlled by pressure directly against the bleeding area. If no bandages are available, a clean cloth can be used to press against the wound or almost anything else in emergencies. Once the decision is made that a tourniquet is to be used, keep it on! You are using this device to save a man's life and you must be willing to risk loss of the limb. Remember, if you use a tourniquet, be bold, but never use it if pressure against the bleeding site will accomplish the same thing.

#

FATIGUE...OR FEAR?

"Fatigue or fear -- which plays the greater part in those 'disorders of skill' which lead to flying accidents? A quarter of a century ago, when the Cambridge Psychological Laboratory produced its experimental set-up known as the 'Cambridge cockpit,' it took it for granted that fatigue was virtually the only cause.

"But it soon became evident that fear was the major culprit -- not so much the fear of getting hurt, but something more in the nature of anxiety or worry, such as fear of inability to complete a mission, or domestic troubles, or other factors. 'Anticipatory tension' is the term used by D. Russell Davis in a new book, Aviation Psychology, edited by A. Cassie and others and published by Charles Skilton, London. The book contains a selection of papers from two recent meetings of the Western European Association for Aviation Psychology.

"Russell Davis is worried that the importance of the fatigue factor in accidents is coming back into favour, due perhaps to an impression that the fear factor operates mainly in wartime. Yet disorders of skill can result, he says, 'whenever the outcome of a task in which a person is highly motivated appears to him to be in doubt -- that is, at times of uncertainty, insecurity or impaired confidence.'

"The trouble is that the natural response, when dangers appear imminent, is for reactions to become more rapid, forceful and extensive. Normally, Russell Davis points out, such increased reactions are of biological value, but in flying the very opposite may be true, for 'many of the danger situations met by pilots require not vigorous activity but restrained, deliberate and accurate responses.'

"Another type of response to anxiety is 'disintegration of the sensory field.' Experiments showed that, for instance, the subject would at first respond to the display of instruments as an interconnected whole; then, as anxiety increased, he tended more and more to respond to each instrument independently, and in consequence he became liable to misinterpret a change in an instrument reading.

"In another experiment, when subjects suffering from anxiety states were shown a dim picture, gradually increasing in clarity, they 'began to impose organization on the patterns of light and shade long before it was possible for them to make out what the picture really showed.'"

-- Flight Safety Foundation
Accident Prevention Bulletin 6-65

#

"FOOLISH MISTAKES..."

"It is recommended that pilots not make foolish mistakes." Sound funny? Well, it's not as funny as you might think. A flight surgeon wrote this in an MOR. Here is the Discussion and Recommendation verbatim from the MOR. He makes some good points.

"It is recommended that pilots not make foolish mistakes. This remark is not meant to be impertinent but to show in a poignant way the essence of the problem. The specific answer as to why the pilot's shoulder and arm muscles caused his finger tip to move to the wrong feathering button and push it is to ultimately be found only in the neurophysiological 'circuitry' of his brain. In what way did the 'wiring' or 'relay' fail? How was it 'programmed' incorrectly? How could it have been made 'fail-safe'? These answers are not forthcoming and until such information about the human brain is discovered and can be manipulated, we must content ourselves with the present system. Psychological testing and selection, physical examinations, interviews, individualized flight instruction with 'downs' and extra help when needed, disposition boards, periodic check hops and continuing training... these are many of the present techniques used to select the men most likely to perform successfully and to train them so that their errors will be minimized. The pilot reaped abundantly the benefits of this system. At any stage of his training he would have had to be called a marginal student. His aptitude for flying is and always has been low. Yet this fine training system made him a pilot and prevented any mishaps until the present one. It placed at his side a skilled aviator who prevented this mishap from becoming a more serious or fatal one. Yet this system, as good as it is, will not and will never make infallible pilots out of humans who by nature are fallible. Men with high flight aptitudes will make few errors. Less well qualified men will make more errors. To the extent that operational demands require selection from marginal candidates, more instances of poor headwork and pilot error will be found. This is axiomatic and must be lived with.

"The only aeromedical recommendation which can be made is that, as much as operational needs will permit, continuing emphasis be given to the utilization of high physical and psychological standards for acceptance and continuing effort be made to give high quality, thoughtful, individualized training to each aspiring pilot. Such effort will not prevent all such accidents in the future, but it should reduce their number to a minimum."

#

NEAR FATAL CASE OF DYSBARISM

A 45 year old, "moderately obese" pilot with a history of mild dysbarism 18 years before was flying as dual pilot in a T33B with a malfunctioning cabin pressurization system. At 35,000 feet he began to experience spots before his eyes, severe air hunger and perspiration and weakness. His left arm became paralyzed. Instead of declaring an emergency and descending, the pilot stayed at 35,000' for 21-24 minutes after becoming aware of the dual pilot's distress, then descended to 25,000' for 16 minutes before proceeding to an Air Force Base and landing. Rapidity of the aircraft's climb to altitude had reduced the length of time the crew was on 100% oxygen (NATOPS says the oxygen regulation in this aircraft "shall be set for 100% for landings and takeoffs only.")

A story based on the flight phase of this incident will probably appear in Approach in the coming months. Here is the flight surgeon's report of the medical aspects from the MOR. This material will not appear in the magazine. Save it for future use:

After the aircraft was shut-down, a workstand was placed next to the plane and the dual pilot was assisted out of the cockpit by the medical personnel. He was quickly examined at the scene by an Air Force flight surgeon who noted that he exhibited much difficulty using his left arm and that his speech was slightly slurred. He was admitted to the station hospital at the AFB with the diagnosis of "Observation Medical, possible dysbarism." The flight surgeon then did a more thorough examination which revealed only some left bicipital and deltoid weakness and moderately slurred speech. There were no cerebellar signs or sensory abnormalities, though the patient was complaining of numbness of the left hand. He was observed closely and about five hours after being admitted, his condition was seen to deteriorate in that there were now complaints of weakness involving both arms.

Objectively weakness could only be detected in the left arm but had worsened to the extent that he was essentially unable to move it. His speech became more slurred; his handwriting became illegible; and his sensorium became quite sluggish. At this time he was placed on the serious list. An electrocardiogram was considered to be normal. The hematocrit was 49%. Shortly thereafter intravenous fluids were started and he was placed in an oxygen tent.

Because of his changing neurological signs, it was decided to air evacuate him to the nearest compression chamber. During the flight in a well pressurized aircraft the flight surgeon accompanied the patient and the intravenous solutions were continued. His blood pressure was seen to drop to less than 100 systolic and the pulse increased somewhat giving evidence of impending shock which was quickly avoided by means of the intravenous fluids. His neurologic symptoms seemed to improve slightly with some decrease in the slurred speech and slow mentation and he seemed to have less difficulty with his right arm which had become partially paralyzed just prior to this flight.

After about 12 hours, three of which were spent enroute, they arrived and hyperbaric treatment in the compression chamber was started. Examination by a medical officer just before starting treatment revealed the patient to have almost complete paralysis of the left upper extremity, partial paralysis of the right, locomotor ataxia, slurred speech, and some mental confusion.

The recompression schedule utilized was upon the advice of a consultant at the Naval Experimental Diving Unit, Washington, D. C. rather than the standard Navy recompression tables. This schedule consisted of taking the patient to a depth of 60 feet (2.7 atmospheres absolute pressure) and leaving him there for 75 minutes during which he breathed alternately 100% oxygen for 30 minutes, then air for 15 minutes, etc. After 75 minutes he was ascended to a depth of 30 feet (1.8 atmospheres absolute pressure) in 30 minutes while breathing 100% oxygen. He remained at 30 feet for 150 minutes breathing alternately 100% oxygen for 60 minutes, air for 15 minutes, etc. He was finally brought to the surface at a one foot per minute rate of ascent while breathing 100% oxygen. This first run encompassed a total of 285 minutes (4 3/4 hours) in which he breathed 100% oxygen for a total of 240 minutes and air for a total of 45 minutes.

Some improvement was seen during the above treatment but the patient began to have a relapse shortly after surfacing. He was therefore again placed in the compression chamber and a second treatment schedule was used upon the advice of N.E.D.U. He was taken to a depth of 30 feet (1.8 atmospheres absolute pressure) where he remained for almost 26 hours alternately breathing 100% oxygen for 60 minutes and air for 15 minutes. Eventually the air breathing intervals were gradually increased after he developed symptoms of the local irritative effects of oxygen; e.g., sore throat and cough. He therefore breathed 100% oxygen at 1.8 atmospheres absolute pressure for a total of 1,028 minutes (17 hours) and air at the same pressure for a total of 525 minutes (8 3/4 hours). He was then brought to the surface while breathing air.

Both of these procedures have been developed by the Naval Experimental Diving Unit in an attempt to use a minimal amount of pressure in the recompression treatment of decompression sickness and thus avoid having the patients develop decompression sickness secondary to the recompression treatment alone. This as yet is unpublished data and will appear in an Experimental Diving Unit Research Report #5-65 entitled "Minimal Pressure Oxygen Breathing Approach to the Recompression Treatment of Decompression Sickness In Divers and Aviators," written by CAPT WORKMAN, MC, USN, and LCDR M. W. GOODMAN, MC, USN.

This second recompression procedure was of much benefit to the patient. He regained the deficits lost after surfacing from the first recompression period and, in addition, exhibited further neurological improvement. It is of interest to note that during the second recompression period he seemed to improve quickly while breathing the hyperbaric 100% oxygen but then deteriorated while breathing the hyperbaric air. This persisted for a number of hours and eventually the amount of deterioration became less and less until it ceased to occur. No relapse occurred after he had been out of the chamber for six hours. He was thus transferred to a U. S. Naval Hospital. At the time of the transfer he had only slight weakness of the left arm and shoulder, some hyperreflexia of the left arm, slight incoordination of both hands, slight ataxia, and slightly slurred speech...quite an improvement as compared to when he first entered the recompression chamber.

He remained at the hospital five days during which time rapid recovery occurred. The laboratory work done at the hospital including a CBC, UA, BUN, CO_2, Chloride, EKG, and chest X-ray were all within normal limits. He was discharged to the care of this physician essentially completely recovered from this bizarre episode.

Since his return to this facility a complete physical examination and repeated neurological examinations have failed to reveal any significant abnormalities other than his slight obesity and a questionably hyperreflexic left biceps reflex. An electrocardiogram, chest X-ray, CBC, BUN, Bilirubin, three hour glucose tolerance test, and X-rays of the skull have all been either negative or within normal limits. An electroencephalogram was obtained at the naval hospital and was interpreted as being "normal for age.

The patient is presently considered to be essentially completely recovered from this episode; an episode that can only be attributed to decompression sickness with aeroembolism. He has been returned to full duty and the final recommendation concerning his flight status will be that he be restricted to altitudes less than 20,000 feet.

#

PEARLS...

1. An MOR recently came and listed a pilot who was on a 350 calorie diet for 20 days prior to an annual physical and was listed in "excellent physical condition." He had lost 30 pounds and had taken no prescription during this diet. His weight on physical was 181 pounds, and he was 70" tall.

This diet seems quite steep especially when a pilot is expected to fly a high performance aircraft on this intake. Seems to me with proper psychological stimulation toward having a better physical specimen present at an annual physical metered and disciplined over a year's time is the goal rather than a 20 day crash effort.

Incidentally this same man had the day following his physical three full meals before he was killed.

2. LCDR James R. NELSON, MC, USNR, staff neurologist at the U. S. Naval School of Aviation Medicine, Pensacola, is currently working on a paper on behavioral abnormalities in man evoked by light for the Journal of Aerospace Medicine. He made an excellent presentation on this topic at the Naval Aviation Safety Center sponsored Contractor's Safety Representative Conference in April. Dr. Nelson will be detached from active duty in July and will join the faculty of UCLA Medical School.

3. Refresh your memory on shark attack reporting by rereading BuMed Inst. 6400.2.

4. Alcohol - Well, it's about time we cover this a little bit since we have been noticing a few discrepancies in the MOR -- for instance -- we look very carefully at the chronological history. Listed there often is a history of a "few drinks." Now, we're not saying all aviators shouldn't drink - not in the least - but when documented in this history is a record of 5-7 gin and tonics or any hard liquor sometime between 2100 the day preceeding the accident and terminating at 0100 and the accident occurring at 0903, some 8 hours and 3 minutes later one begins to wonder. Often here, Gents, no blood alcohol is drawn. Again no one person is trying to shoot down any aviators but these people we take care of have a tremendous obligation to all of us. They are professional aviators. Their personalities are constantly training for a "match" that we hope will never arise but nevertheless they should be as physically fit as possible. No professional baseball team will tolerate an error on the playing field due to XS ETOH. Any one game could mean the pennant for them.

A correlation here: Human factors - high performance aircraft - mission assignment, etc., are many factors that aviators, daily, have to fly with. Why add a substantial liability that could mean the difference in bring back the bird - or not.

Suggestion: Draw more blood alcohols, again, with the idea of doing your job more thoroughly and encouraging your aviators to do the same. OPNAVINST 3750.6E gives you this authority and these blood ETOHs should be drawn routinely, just as all chemistries, simply for a screen. We don't know what role blood ETOH has played in the accidents in the past since after reading the MORs you guys make no mention in your summaries about an aviator who has an intake of 120 cc of ETOH - and some 8 hours and 3 minutes later is involved in an accident.

If you will take the time to draw these, I assure you Naval air will profit. If you don't care about saving a life then think of this - average cost of aircraft accident fiscal 65 - re - $750,000 each. Think of the party we could throw with that.

#

Flight Surgeon's NEWSLETTER

(This material is for the information of Navy flight surgeons only and does not necessarily reflect endorsement by the Navy or the Naval Aviation Safety Center.)

IDENTIFICATION OF REMAINS

In mass casualty type aircraft accidents, two problems which occur quite commonly are identification and preservation of remains. The mass casualty bill often provides general guide lines for dealing with such situations but fails to give specific information essential to solving the problems at hand. Following are some suggestions regarding identification and preservation which may prove useful if you are ever faced with this type accident.

Identification may not pose a serious problem when the bodies remain relatively intact. Fingerprints, dentition and visual identification are usually sufficient for positively establishing identity. However, where there is mutilation, fragmentation, charring, immersion, chemical alteration, etc., a hangover proportion headache develops for the individual responsible for identification. Many activities are not geared for such an operation and outside assistance must be sought. In a number of locales, law enforcement agencies are capable of providing excellent identification service. This is especially true of large city and state police departments. Prior agreements made with these agencies, THROUGH PROPER AUTHORITY, will dispense with the red tape and delays which might be expected otherwise.

The FBI and USAF both have skilled identification teams. Where the need for the assistance of either of these groups arises, it is suggested that the appropriate authority (usually the District Medical Officer) be advised of the desirability of obtaining such services.

As many of you know from past experience, identification can present what appears to be an insurmountable obstacle. Even the experts are occasionally baffled in "making a positive" but overall they are amazingly successful. Their secret lies in paying meticulous attention to detail and searching relentlessly for trace evidence. There are a number of forensic texts which consider the subject of identification. It is well worth your while to spend several hours browsing through some of this material to develop a feel for what constitutes identification clues and trace evidence. From this you will see that apparently irrelevant clues to the uninitiated are often the gold mine of the experienced investigator.

The second major problem which may be encountered is preservation of remains. In metropolitian areas adequate morgue facilities are usually available to handle sizeable numbers of casualties. On the other hand, smaller cities and rural areas generally do not have satisfactory morgue facilities. Several courses of action can be taken when the latter situation prevails. Large refrigerated rooms (ice plants, canning factories, slaughter houses, etc.) are fairly common even in remote areas. Permission may be obtained from

those in charge to use such facilities by a tactful explanation of the necessity for their utilization. Considering permission is granted, extreme caution must be taken to adequately encase the remains and carefully handle them to prevent contamination and offensive odors in the facility.

In cold climates where daily temperatures do not rise much above 40°F., nature has provided you with a "do-it-yourself" cold box. A large unheated building, room, tent, lean-to, etc., can serve adequately as a temporary morgue. A word of caution about using this type lash up -- make sure that dogs, cats and other members of the animal kingdom are excluded from the premises.

Often a refrigerated trailer or truck is an ideal solution to the morgue problem and offers the distinct advantage of being mobile. These units are frequently available at government installations as well as from civilian sources.

As a last resort, the remains can be packed in ice but precaution must be taken to ensure that they do not become water soaked. If you have an insufficient supply of remains pouches, there are a number of items which can be pressed into service as substitutes. Plastic materials such as shower curtains, garment bags, mattress covers, sheets, furniture covers, etc., can be jury rigged as body pouches. Rubberized sheets also make an acceptable substitute. Care must be taken to ensure there is no leakage of fluid from the containers and the remains are sealed off from the air. This serves two purposes: it minimizes odor and soilage in the holding area and avoids contamination of the remains which might influence toxicology studies.

One final note: know your legal position thoroughly. Cooperate to the utmost with local authorities -- remember that in many cases they have jurisdiction even though military personnel are involved. Also, don't release remains prematurely. To do so may result in having to dispose of additional tissue found later on and/or loss of material valuable to the investigation.

-- LCDR WALTER D. GABLE, MC, USN
SMO, USS TICONDEROGA
Aviation Pathologist

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CHARCOAL AS A POISON ADSORBENT

The June 18, 1965 issue of The Medical Letter on Drugs and Therapeutics had an interesting article on the use of activated charcoal as a poison adsorbent. The following is quoted for information:

"Activated charcoal (powder, not tablets) is believed to be effective in the treatment of accidental poisoning because of its ability to adsorb many chemicals. Whether the adsorbing power of a prepared suspension of charcoal in water, as in the Ipechar kit*, is as great as that of a freshly

*Ipechar (Hoyt) is a poison control kit containing a bottle of syrup of ipecac and a bottle of a suspension of activated charcoal in water. - Ed.

mixed suspension, is not known, nor is the optimum dose known (one ounce of a 25% suspension is supplied in the kit). It (the charcoal suspension) is best administered after gastric lavage or vomiting.

"Some texts on poisoning recommend the use of a 'universal antidote' consisting of magnesium oxide, tannic acid, and activated charcoal. Medical Letter consultants do not recommend thi antidote because of serious toxic effects of tannic acid on the liver and because charcoal alone probably has greater adsorptive effect."

--- CDR L. R. KAUFMAN, MSC, USN
Head, Environmental Health Division

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LET'S KEEP IN CONTACT

Captain Dick NAUMAN of NAS JAX contributes the following news:

"Recently lost -- LCDR Jim BROUGH, VP-30, to USS WASP; LT Dick SPENCER, VW-4, to civilian residency; LT Bob BEANBLOSSOM to civilian practice; LT Don RISINGER's deployment; LT Gaines JONES' deployment; LT John GILLEN's deployment -- and naturally the many GMO's lost without contact reliefs. Recently gained LT Woody BURROW from CAG-15 to NAS; LT Len OUZTS to VP-30; LT Gaines JONES to FAW-11; LT Al SNYDER to VW-4 -- all most welcome!

"Course Jay BROWN at Cecil has had a number of changes and with all three Mayport carriers out at once, he is more affected than I for it means six flight surgeons gone at one time. He recently acquired LT J. SPENCE to VA-44 and was most happy to get LT's Roger ATKINS and Hal ASHWORTH back from an eight-month deployment with CAW-3 on the SARATOGA. Interesting note -- LT 'Howie' BERG ruptured an appendix just prior to deployment but 'tiger' that he is insisted he would deploy several weeks ago with CAW-1 on board FDR even if they had to carry him aboard. He made it!

"Naturally, the biggest news in our entire area for many years was LCDR Joe KERWIN's selection as one of the six scientific astronauts. I reiterate what all of us in this area feel -- 'it couldn't happen to a more wonderful and deserving guy!' We are extremely happy for Joe and though we hated losing him know that he will succeed in his new job.

"Joe has been replaced by an equally capable flight surgeon, LCDR Al ADEEB, formerly a CAG-3 flight surgeon who just got his aviator wings at Pensacola. Navy medicine is old hat to Al, and JAX being his home, he is looking forward to a lengthy stay.

"About all for now except that my tour with COMFAIRJAX with the 'opportunity' to inspect all East Coast CVA's is most enlightening. Although I just came from a three year tour on INDEPENDENCE about four years ago, I can only advise shore based flight surgeons, especially SMO types, to get out to these

carriers and see what is going on, especially in line of safety programs such as those done by Frank AUSTIN and Stu RAGLAND. One can always talk about 'safety back in my day on the old Langley' but it's mighty good to see younger MO's putting it to real practice today."

From Captain Ed WURZEL, now Director of the Aerospace Medical Research Department of the Naval Air Development Center, Johnsville, Pennsylvania, comes the following:

"Mary, the boys and I are all well. Recently, we moved to a new home in Doylestown, Pa. - a rambling early 19th century farmhouse which we are busily refurbishing. LCDR Elihu YORK, MC, USN, (Class 106), Head of our Medical Division, has been busy with medical research projects; in addition, he is the proud father of a nine month old boy, and has managed to take a few golf lessons the past spring. LT Gerald VANDERHOOFT, MC, USN, (Class 105), is in charge of the dispensary at the Naval Air Facility; he did an excellent job investigating a helicopter accident last fall, has been an important member of our local board of flight surgeons; he is also an avid golfer, and explorer of the Pocono Mountains on weekends. He is the proud father of a one year old daughter. LT Leon M. MIELCAREK, Jr., MC, USNR, (Class 107) is also busy at the NAF dispensary, but finds time to take private flying lessons, and as our 'eligible bachelor' has been seen squiring several attractive young ladies to the various social events at the Naval Air Development Center. As you can gather from the foregoing remarks, we have a capable crew of diversified talents."

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PEARLS....

1. This item is quoted from the NAS Glenview Safety Council: "Utilization of A.W.S. flight surgeons: Flight surgeons are not attending squadron briefings nor are they working with the flight crews in the capacity that BuMed intends that they should. The Council recommended that the NAS flight surgeon ensure that A.W.S. flight surgeons participate as much as possible with squadron flight personnel so that they will benefit from their instructions and surveillance." Before it crossed our desk, someone had added, "How about Saturday A. M. pilot safety briefing, at least..."

2. Again we remind you flight surgeons, when preparing your MORs, to check out your non-medical comments with the riggers, maintenance officer, or whoever is the best available authority in the subject area you are discussing. This will help you avoid mistaken theories and embarrassing errors.

3. A number of flight surgeons have failed to include their summaries and conclusions in their MORs. It goes without saying that this information is a key part of the MOR and often determines the whole report's effectiveness.

4. For the first time somebody has sent us some guest-written pearls! Thanks to LCDR Mike DUNNE, SMO of USS HORNET (CVS-12) for the following items:

Some 'pearls' picked up aboard 'HORNET':

1. Have reflective tape put on all flight deck crew noise attenuation ear pieces -- several "near misses" prevented owing to pilot spotting reflection!

2. Have all helos carry two or four blankets: recent rescue involving pick-up of four showed need for blankets aboard rescue helo to warm first rescued.

3. Have all flight deck and boat crew personnel trained in use of "horse collar" and "seat" pick-up apparatus -- in pick-up following capsized motor whale boat, only one in six knew how to use "horse collar": fortunately this man, a hospital corpsman, put collar on all concerned before being rescued. All corpsmen should, aboard carriers, be trained for helo rescue, too.

4. Have all medical officers trained in use of helo rescue ops. and include non-flight surgeons since recent need for HORNET surgeon required same: our surgeon was, fortunately, given four hours actual training PTA.

5. Have "crash" bag ready in Flight Deck Control: delay in getting sterile equipment from Sick Bay to Flight Deck could be fatal in event pilot or crew was unable to be removed from aircraft or flight deck.

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SEND CHANGE OF ADDRESS TO BUMED, NOT TO NASC

Flight surgeons are reminded to send their changes of address for Approach mailing, etc., to BuMed Code 4522, Attention Mr. Washington and not to the Naval Aviation Safety Center. Although the magazine and the Flight Surgeon's Newsletter are mailed from Norfolk, the mailing address labels are supplied to the Safety Center by BuMed from its records.

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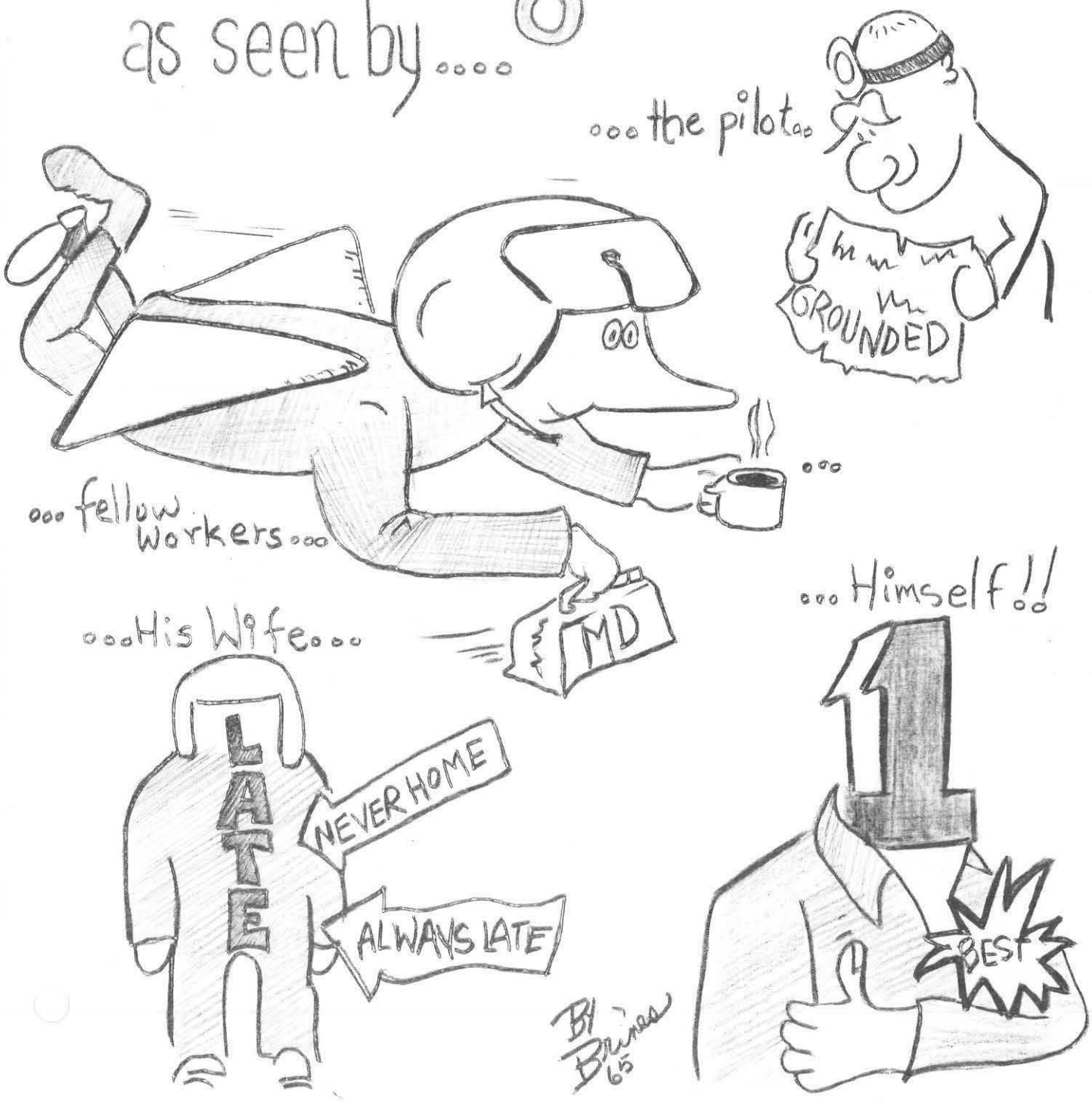
The Flight Surgeon

as seen by....

This cartoon is the work of
George P. Brines, HN (AC),
Medical Dept., NAAS, Kingsville.



ENCLOSURE 1

GUIDE FOR PHYSIOLOGICAL INSTRUCTION FOR AVIATORS

Compiled by

ROBERT L. KINNEMAN, LCDR, MC, USN

SMO, USS CORAL SEA (CVA-43)

Enclosure 1
to FSNL 8-65

ENCLOSURE 1

Class Session 1

INTRODUCTION TO THE PHYSIOLOGY OF THE HEART AND LUNGS

Objectives for this Session:

1. To point out to the class the basic circulation of the blood.
2. To acquire an understanding of the manner in which the oxygen passes through the lung tissue into the blood stream.
3. To demonstrate the way oxygen gets to the tissues.
4. To show how the waste products are picked up from the tissues of the body and transported by the blood stream to the point of excretion.
5. Correlate the physics of the atmosphere to these bodily processes.

Plan of Procedure:

Part I Lecture: Basic Fundamental Physiology of the Heart and Lungs, and How This Relates to the Physics of the Atmosphere (30 minutes).

Part II Class discussion (30 minutes).

(In addition, one or more of the below listed training films may be shown).

Materials for this Session:

1. Model of the heart.
2. Diagram of the heart, lung circulation.
3. Blackboard and chalk.

Training Films Available:

1. SAM 1-62 THE HUMAN BODY: Circulatory System (14 minutes).
2. SAM 1-63 THE HUMAN BODY: Respiratory System (14 minutes).
3. SAM 1-90 HEALTHY LUNGS (11 minutes).
4. TF 1-4888 HEART AND CIRCULATION (11 minutes).
5. TF 1-4889 MECHANISM OF BREATHING (11 minutes).
6. TF 1-8187 RESPIRATION AND CIRCULATION (26 minutes).
7. TF 1-8207 INTRODUCTION TO RESPIRATORY & CARDIAC RESUSCITATION (34 minutes).

References:

1. High Speed Flight Information for Pilots, NAVEXOS P-960, 1954, pp. 77-ff.
2. Maj. Gen. Harry G. Armstrong, USAF Ret, Aerospace Medicine, The Williams and Wilkins Co., 1961, pp. 109-160.
3. Physiology of Flight, AFP 160-10-4, pp. 1-24.
4. Your Body in Flight, AF Manual 51-7, pp. 1-10.
5. Samson Wright, Applied Physiology, Oxford Medical Publications, Ninth Edition, pp. 233-481.

Class Session 2 REVIEW OF HYPOXIA AND PRESSURE SUIT INDOCTRINATION

Objectives for this Session:

1. To review with the class the mechanism of how the oxygen enters the blood stream.
2. To have the students experience the symptoms of hypoxia.
3. To point out to the class the differences between hypoxia and hyperventilation.
4. To give the student an opportunity to be fitted to the full pressure high altitude garment.

Plan of Procedure:

Part I Lecture: Hypoxia and the Pressure Suit (30 minutes).
Part II Class Discussion (30 minutes).
Part III Fitting Each Member of the Class in the Pressure Suit (45 minutes).
Part IV Low Pressure Chamber Flight to a Simulated 80,000 Feet (45 minutes).

(In addition, one or more of the below listed training films may be shown as desired).

Materials for this Session:

1. Working model of the oxygen and pressure suit systems.
2. Assorted sizes of full pressure suits.
3. Blackboard and chalk.

Training Films Available:

1.	FTA 125	CONSOLE BREATHING AND CHAMBER FLIGHT DURING T-1 SUIT INDOCTRINATION (9 minutes).
2.	FTA 359a	MC-3 AND MC-4 PRESSURE SUITS - Utilization in Altitude Chamber (12 minutes).
3.	FTA 359b	MC-3 AND MC-4 PRESSURE SUITS - Operational Capabilities and Limitations (12 minutes).
4.	ETA 472	EMERGENCY ALTITUDE SUIT - Type CSU-4/P (13 minutes).
5.	MN 8323	FULL PRESSURE SUIT, MARK IV (20 minutes).
6.	SAM 1-27	CANADIAN DECOMPRESSION (16 minutes).
7.	SAM 1-32	PHYSIOLOGY OF ANOXIA - The Basis of Inhalation Therapy (20 minutes).
8.	SAM 1-86	OXYGEN (11 minutes).
9.	SAM 2-98	HYPOXIA AND DECOMPRESSION (20 minutes).
10.	TF 1-4969	AIRCRAFT PRESSURIZATION (24 minutes).
11.	TF 1-5372	RAPID DECOMPRESSION (17 minutes).
12.	TF 1-8174	HUFF AND PUFF (7 minutes).
13.	TF 1-8177	LIVING WITH OXYGEN (22 minutes).
14.	TF 1-8192	PRESSURE SUITS (24 minutes).
15.	USAF 11213	PARTIAL PRESSURE SUIT (40 minutes).

References:

1. Your Body in Flight, AF Manual 51-7, pp. 19-40.
2. Physiology of Flight, AFP 160-10-4, pp. 25-33, 49-65.
3. High Speed Flight Information for Pilots, NAVEXOS P-960, 1954, pp. 87-91.
4. Maj. Gen. Harry G. Armstrong, USAF Ret., Aerospace Medicine, The Williams and Wilkins Co., 1961, pp. 189-218.

Enclosure 1
to FSNL 8-65

Class Session 3

DYSBARISM (BUBBLE TROUBLE)

Objectives for this Session:

1. To review the principles of Henry's Law and the Law of Diffusion.
2. To point out the effects of gas expansion in the middle ear, sinus cavities, and the bowel.
3. To explain the mechanism of the "bends."
4. To review the symptoms of the "bends."
5. To give the pilots some understanding of emergency procedures to combat dysbarism.

Plan of Procedure:

Part I Lecture: Basic Gas Laws, and How They Relate to Dysbarism (30 minutes).

Part II Class Discussion (30 minutes).

(Alternative: One or more of the below listed training films may be shown).

Materials for this Session:

1. Model of middle ear.
2. Charts of altitude and pressure changes.
3. Blackboard and chalk.

Training Films Available:

1. TF 1-4021 PHYSIOLOGY OF HIGH ALTITUDE FLYING (12 minutes).
2. TF 1-8188 DECOMPRESSION SICKNESS IN FLIGHT (30 minutes).

References:

1. High Speed Flight Information for Pilots, NAVEXOS P-960, 1954, pp. 82-91.
2. Physiology of Flight, AFP 160-10-4, pp. 34-49.
3. Your Body in Flight, AF Manual 51-7, pp. 11-19.
4. Maj. Gen. Harry G. Armstrong, USAF Ret., Aerospace Medicine, The Williams and Wilkins Co., 1961, pp. 162-188.

Class Session 4

THE EFFECTS OF ALCOHOL

Objectives for this Session:

1. To point out the acute effects of alcohol on the body.
2. To make the pilots aware of the long term effects of alcohol.
3. To briefly go over the method of alcohol excretion from the body and time intervals involved.

Plan of Procedure:

Part I Lecture: The Acute and Chronic Effects of Alcohol (20 minutes).

Part II Class Discussion (40 minutes).

Materials for this Session:

1. Locally produced flipchart.
2. Blackboard and chalk.

References:

1. Maj. Gen. Harry G. Armstrong, USAF Ret., Aerospace Medicine, The Williams and Wilkins Co., 1961, pp. 522-523.
2. High Speed Flight Information for Pilots, NAVEXOS P-960, 1954, pp. 143-145.
3. Ross A. McFarland, Ph.D., Human Factors in Air Transportation, McGraw-Hill, 1953, pp. 292-299.

Class Session 5

THE EFFECTS OF TOBACCO

Objectives for this Session:

1. To point out to the students the effects of smoking on the body.
2. To review the effects of carbon monoxide and how this pertains to smoking.
3. To make the pilots aware of the increased danger of carcinoma of the lung with smoking.
4. To point out the effects of smoking on night vision.

Plan of Procedure:

Part I Lecture: Why Pilots Should Not Smoke (20 minutes).

Part II Class Discussion (40 minutes).

Materials for this Session:

1. Locally produced flipchart.
2. Blackboard and chalk.

References:

1. High Speed Flight Information for Pilots, NAVEXOS P-960, 1954, pp. 145-148.
2. Maj. Gen. Harry G. Armstrong, USAF Ret., Aerospace Medicine, The Williams and Wilkins Co., 1961, pp. 523-524.
3. Ross A. McFarland, Ph.D., Human Factors in Air Transportation, McGraw-Hill, 1953, pp. 299-307.
4. Smoking and Health - Report of the Advisory Committee to the Surgeon of the Public Health Service, Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

Class Session 6

THE EFFECTS OF CARBON MONOXIDE

Objectives for this Session:

1. To review the sources of carbon monoxide in aircraft.
2. To point out the affinity of hemoglobin for carbon monoxide.
3. To review the symptoms of carbon monoxide poisoning.
4. To show the pilots what to do when they suspect carbon monoxide poisoning.

Plan of Procedure:

Part I Lecture: The Effects of Carbon Monoxide on the Body, and What to Do About It (30 minutes).

Part II Class Discussion (30 minutes).

Materials for this Session:

1. Locally produced flipchart.
2. Blackboard and chalk.

References:

1. Ross A. McFarland, Ph.D., Human Factors in Air Transportation, McGraw-Hill. 1953, pp. 174-175, 203, 301-303, 465, 468, 470, and 706.
2. Physiology of Flight, FFP 160-10-4, pp. 149-151.
3. Maj. Gen. Harry G. Armstrong, USAF Ret., Aerospace Medicine, The Williams and Wilkins Co., 1961, pp. 497-501.

Class Session 7

DRUG EFFECTS

Objectives for this Session:

1. To point out to the pilots the therapeutic effects of drugs and the side effects that are contraindicated to flying.
2. To make the pilots aware of the dangers of self and minor medication.
3. To encourage the pilot to seek proper medical aid from a flight surgeon for all illnesses.

Plan of Procedure:

Part I Lecture: Why You Should Not Fly While Taking Medication (15 minutes).

Part II Movie: FLYING WITH MINOR AND/OR SELF MEDICATION, FR 2773 (14 minutes).

Part III Class Discussion (30 minutes).

Materials for this Session:

1. Locally produced flipchart.
2. Movie projector and screen.
3. Blackboard and chalk.

References:

1. Guide to Drug Hazards in Aviation Medicine: Federal Aviation Agency, 1962, Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. - Price 55 cents.
2. High Speed Flight Information for Pilots, NAVEXOS P-960, 1954, pp. 148-149.
3. Ross A. McFarland, Ph.D., Human Factors in Air Transportation, McGraw-Hill, 1953, pp. 307-314, 321.
4. Maj. Gen. Harry G. Armstrong, USAF Ret., Aerospace Medicine, The Williams and Wilkins Co., 1961, pp. 516-519.

Enclosure 1
to FSNL 8-65

Class Session 8

ACCELERATION

Objectives for this Session:

1. To review the effects of positive and negative linear acceleration.
2. To point out the difference between linear and angular acceleration.
3. To describe to the pilots the symptoms of red-out, gray-out, and black-out.
4. To demonstrate to the students the Mark I maneuver to increase tolerance to G forces.
5. To demonstrate to the pilots the anti-G suits.

Plan of Procedure:

Part I Lecture: The Effects of Increased G Forces on the Body (30 minutes).

Part II Demonstration: The Mark I Maneuver and the Anti-G Suit (5 minutes).

Part III Class Discussion (30 minutes).

(In addition, one or more of the below listed training films may be shown as desired).

Materials for this Session:

1. Locally produced flipchart.
2. Anti-G suits.
3. Blackboard and chalk.

Training Films Available:

1. SAM 1-17 ZERO GRAVITY STUDIES (10 minutes).
2. TF 1-4964 G FACTS (28 minutes).
3. TF 1-8194 G FORCES (30 minutes).
4. USAF 29045 HUMAN AND SYSTEM PERFORMANCE ZERO G (18 minutes).
5. USAF 29141 ZERO GRAVITY STUDIES (10 minutes).

References:

1. Physiology of Flight, AFP 160-10-4, pp. 117-141.
2. High Speed Flight Information for Pilots, NAVEXOS P-960, 1954, pp. 99-ff.
3. Your Body in Flight, AF Manual 51-7. pp. 47-53.
4. Maj. Gen. Harry G. Armstrong, USAF Ret., Aerospace Medicine, The Williams and Wilkins Co., 1961, pp. 238-283.

Class Session 9

VERTIGO AND DISORIENTATION

Objectives for this Session:

1. To point out to the class the many ways their senses can lead them astray.
2. To re-emphasize the necessity to believe the instruments.
3. To demonstrate the way the semicircular canals work.
4. To review the oculogravic and oculogyral illusions.

Plan of Procedure:

Part I Lecture: You Can't Always Trust Your Senses (30 minutes).

Part II Class Discussion (30 minutes).

(In addition, one or more of the below listed training films may be shown as desired).

Materials for this Session:

1. Locally produced flipchart.
2. Model of the inner ear.
3. Blackboard and chalk.

Training Films Available:

1. SAM 1-20 DISORIENTATION AND ILLUSIONS (12 minutes).
2. SAM 1-31 MOTION SICKNESS (20 minutes).
3. SAM 1-35 STRUCTURE AND FUNCTION OF THE VESTIBULAR APPARATUS (20 minutes).
4. TF 1-5251 SPATIAL DISORIENTATION IN FLIGHT (17 minutes).

References:

1. Your Body in Flight, AF Manual 51-7, pp. 59-62.
2. High Speed Flight Information for Pilots, NAVEXOS P-960, 1954, pp. 136-141.
3. Physiology of Flight, AFP 160-10-4, pp. 113-117.
4. Maj. Gen. Harry G. Armstrong, USAF Ret., Aerospace Medicine, The Williams and Wilkins Co., 1961, pp. 219-237.

Class Session 10

FATIGUE

Objectives for this Session:

1. To point out to the pilots the differences between acute fatigue, chronic fatigue, skill fatigue, and static fatigue.
2. To review some of the symptoms of the various types of fatigue.
3. To emphasize the importance of physical fitness in the prevention of fatigue.
4. To point out other methods of combating fatigue.
5. To review the restrictions on flying following blood donation.

Plan of Procedure:

Part I Lecture: Flight Fatigue, a Combination of the Four Basic Types of Fatigue (30 minutes).

Part II Class Discussion (30 minutes).

Materials for the Session:

1. Locally produced flipchart.
2. Blackboard and chalk.

References:

1. OPNAV INSTRUCTION 3740.7.
2. Ross A. McFarland, Ph.d., Human Factors in Air Transportation, McGraw-Hill, 1953, pp. 326-369.
3. High Speed Flight Information for Pilots, NAVEXOS P-960, 1954, pp. 149-154.

Class Session 11

VISION

Objectives for this Session:

1. To emphasize the necessity for visual standards in flying.
2. To point out the tricks that can be played on the sense of vision.
3. To review night vision and the autokinetic phenomenon.
4. To point out the mechanism for binocular vision and how the muscles of the eye work.

Plan of Procedure:

Part I Lecture: Your Eyeballs and How They Work (30 minutes).

Part II Class Discussion (30 minutes).

(In addition, one or more of the below listed training films may be shown as desired).

Materials for this Session:

1. Model of the eye and the attached muscle groups.
2. Charts and diagrams of the eye.
3. Locally produced flipchart.
4. Blackboard and chalk.

Training Films Available:

1.	SAM 1-13	VISIBILITY IN LANDING (4 minutes).
2.	MN 3483	ACTION OF THE EXTRA-OCULAR MUSCLES (8 minutes).
3.	SAM 1-88	EYES: Their Structure and Care (11 minutes).
4.	SAM 2-83	EYES IN OUTER SPACE (WALT DISNEY) (26 minutes).
5.	TF 1-5386	HOW TO USE YOUR EYES AT NIGHT (30 minutes).
6.	USAF 18402	VISUAL PROBLEMS OF HIGH SPEED AIRCRAFT (26 minutes).

References:

1. High Speed Flight Information for Pilots, NAVEXOS P-960, 1954, pp. 125-136.
2. Your Body in Flight, AF Manual 51-7, pp. 63-69.
3. Physiology of Flight, AFP 160-10-4, pp. 85-101.
4. Ross A. McFarland, Ph.D., Human Factors in Air Transportation, McGraw-Hill, 1953, pp. 179-185.
5. Maj. Gen. Harry G. Armstrong, USAF Ret., Aerospace Medicine, The Williams and Wilkins Co., 1961, pp. 401-414.

Class Session 12

PRESERVATION OF HEARING

Objectives for this Session:

1. To review the mechanism for hearing.
2. To point out the difference between conductive hearing loss and perceptive hearing loss.
3. To point out the dangers of high intensity noise.
4. To re-emphasize the necessity for "ear defenders."

Plan of Procedure:

Part I Lecture: The Importance of a Hearing Conservation Program in Aviation (30 minutes).

Part II Class Discussion (30 minutes).

(In addition, one or more of the below listed training films may be shown as desired).

Materials for this Session:

1. Model of the ear.
2. Blackboard and chalk.

Training Films Available:

1. FTA 249 EAR DEFENSE FOR JET MECHANICS (31 minutes),
2. TF 1-8193 MEET MR. NOISE (26 minutes).

References:

1. High Speed Flight Information for Pilots, NAVEXOS P-960, 1954, pp. 118-122.
2. Maj. Gen. Harry G. Armstrong, USAF Ret., Aerospace Medicine, The Williams and Wilkins Co., 1961, pp. 324-344.
3. Ross A. McFarland, Ph.D., Human Factors in Air Transportation, McGraw-Hill, 1953, pp. 185-189, 204, 477, 479, 486.
4. Your Body in Flight, AF Manual 51-7, pp. 53-58.
5. Physiology of Flight, AFP 160-10-4, pp. 101-112.

ENCLOSURE 2

RUSSELL W. BAKSIC, LT, MC, USN
FLIGHT SURGEON, VF-124

SURVIVAL
(Squadron Lecture)

This lecture has to do with survival per se and in it I have included comments on a variety of topics. My purpose here is to give you as many "pearls" as possible on a host of seemingly unrelated yet important subjects, subjects about which you should have some basic information.

Underlying any discussion on survival there is a foundation on which any practical information you acquire is added. That foundation is the so-called "mental element" in survival; without it in proper perspective any other practical information that you receive will be virtually worthless. Some months ago, as you may recall, a bush-pilot and his woman companion survived for weeks in a desolate area in Alaska without survival equipment and their survival experience is a perfect example of the importance of the proper mental attitude in a survival situation. One must have, therefore, above all, the will to survive. Along these lines certain basic principles should be emphasized:

(1) Be stubborn and optimistic but help yourself.
(2) First things first; arrange for your basic needs at once.
(3) Set up a definite plan with obtainable goals.
(4) Don't panic; keep busy.
(5) Use every piece of equipment available as survival gear.
(6) Recall all you've heard or experienced about survival situations as applied to the situation in which you find yourself.

This lecture is designed to add to your store of practical survival information.

EJECTION

Ordinarily the first thing to occur in your survival episode will be the ejection sequence. And from a medical point of view the most significant element of the ejection is your correct position in the seat as you go. (Anatomy of the spinal column described on blackboard with emphasis on natural vertebral column curves and the intervertebral discs.) Since from the diagram it is obvious that there are natural curves in the spine in the upright position, any attempt to voluntarily straighten these curves and assume a "poker-spine" will be virtually impossible -- and potentially dangerous. In the normal position the intervertebral discs will absorb the ejection force satisfactorily. However, if an attempt is made to hold the spine as rigid as possible, the ejection forces may act on the supporting spinal muscles and ligaments in such a way to cause severe sprains. On the other hand if attention is not paid to proper positioning and the spine is allowed to flex or bend forward, the ejection forces may be transmitted to the front edges of the vertebrae and fractures may result. It is obvious, therefore,

that a natural position should be assumed with the back neither flexed nor held rigid. In this natural position injuries to the back will be avoided. The back bone has an ejection load tolerance of 20 g and a "jolt" tolerance of almost 250 g per second if positioning is correct; therefore injuries in this area can invariably be ascribed to incorrect positioning, which is why I have emphasized it so much.

Once you're on the ground (or in the water) you enter into another phase of the survival problem and before we discuss specific survival environments (like sea or desert survival) let's go over some general first aid principles (or "primitive medicine"). An acquaintance with primitive medicine or first aid serves two purposes: first, it gives you something to hang your hat on when confronted with a situation which requires such knowledge and makes it less frightening when you have some idea in general what to do; second, it establishes self-confidence that comes from the realization that first aid is nothing more than common sense and the practical result of other people's experience in similar situations. Obviously any bits and pieces of first aid information that you tuck away in the remote corners of your skull will come in handy. Along this line, also, should be obvious the fact that you should try to be as familiar as possible with the area over which you will be flying -- just in case. Knowledge about the terrain, plants, animals and other creatures found in that area may be invaluable if you should happen to have to spend some time among them. Even a little knowledge about such matters is far better than none at all.

WATER

If at all possible boil the water available; if this is impractical or impossible then use the water purification tablets provided. As a last resort drink water that is brackish or "bad," for you can do without food for extended periods, but not water. Remember that vegetation can be an important source of water -- some plants more than others -- and it is here that a working knowledge of the plants you could come across in a given area could come in handy. More will be said about the water problem when we talk about "sea-and-sand" survival.

FOOD

If possible cook everything you eat since some animals can carry harmful disease-producing parasites. Overcoming disgust for some of the things you may have to eat can be an important factor as to how well you do nutritionally. Your diet may include items not usually found on the menu of the Mexican Village or the Marine Room! This is particularly true if you are in a POW situation since you may have to eat the slop served for your own survival. (And remember that golden rule, known, beloved, and handed down from generation to generation of naval aviators: "Never, ever eat the liver of a polar bear!" -- what could be more practical advice than that!!) On a prolonged diet without fruits and vegetables, of course one runs the risk of a true vitamin deficiency, but that will probably be one of the lesser of your problems. Again, let me emphasize that you shouldn't pass up a "meal" because it offends your palatal sensibilities because in the long run it may take days to make up the nutritional value of that unpleasant meal you couldn't get down.

FOOT CARE

This is a very important and often overlooked part of survival. If you can't walk, you can't do a very good job of "escape and evasion." Take care of your feet. Wear the proper boots and get in the habit of using two pairs of socks: an inner cotton or nylon and outer wool pair. Keep your feet (and your socks) as clean as possible. Take your shoes off periodically when you rest but be on guard that some snake or insect doesn't check into your shoe for the night. Remember that good shoes and socks are worth their weight in gold in a survival situation.

TRAUMA

Just another word for the bruises, cuts, fractures, etc., which will be common problems.

For bleeding: by far the simplest and most effective method for stopping it is to use pressure firmly and steadily applied directly on the bleeding site. Don't worry about "pressure points" or tourniquets; most of the bleeding you'll have to deal with can be handled by simple, direct pressure on the area. It is important, however, to maintain the pressure for, say, five minutes. Don't be peeking at the wound every 30 seconds to see if the bleeding has stopped! Now obviously if you're faced with a huge gash or the stump of an arm or leg that's spurting blood in all directions, don't hesitate to use a tourniquet above the wound. Such a situation will most commonly arise when you are taking care of a companion. In any case don't be squeamish, just do what has to be done.

For fractures the most important principle to bear in mind is to "splint 'em where they lie." Splinting a fracture will reduce the pain and (most important) the shock reaction and will obviously give a better end result functionally. Use whatever is handy for splinting and don't worry about how it looks; you're not running the fracture clinic at Mayos'.

Burns may be a problem. They are classified as first through third degree depending on the severity and may include combinations of degrees if more than just minor burns. First degree burns are indicated by skin redness only (like a sunburn). A second degree burn has the added feature of blisters. A third degree burn involves charring of the skin. The prime treatment of burns of any degree is to apply cold to the burned area as quickly as possible. Obviously in a given survival situation this may not be feasible, but remember the principle: immediate application with or immersion in ice cold water is the treatment of choice. Such treatment not only reduces the pain but also prevents the burn reaction from becoming more severe. Obviously a severe burn at the onset will remain severe, but the general principle holds. If blisters are present, don't attempt to break them open. A blister is sterile and by breaking the sterile envelope you open the area to possible infection. If the blister does breal spontaneously, let the top fall on the raw skin underneath rather than peeling it off since it will function as an effective bandage for the raw area while healing takes place. Always try to keep burned areas clean, since such injured skin is more susceptible to infection.

INFECTIONS

An infected area, whether developing spontaneously or in a previous cut or scratch, will usually present itself as an area that is red and tender and sometimes pus covered. With infections of any kind local cleansing and the application of heat (preferably moist heat) are mainstays of therapy. If a collection of pus becomes obvious, as in a boil, it must be opened and drained with any relatively clean, sharp instrument (and not by squeezing since this only enhances the spread of the infection). If dead or severely damaged tissue is present in a wound or infected area it should be removed manually (debridement). Maggots may infest a wound and, although this is a disgusting phenomenon, they do serve a useful purpose in that they will debride wound of dead tissue only, leaving the healthy tissue untouched. Wounds and infected areas should of course be made clean as possible and this is best done with warm, preferably sterile, water; however, urine may be used as a substitute if water is not available since urine is ordinarily sterile.

DYSENTERY

Dysentery is a common survival problem since it can be initiated not only by bacteria and viruses but from a simple change in water and diet. In a survival situation (eg. jungle, POW) it is said that 8-10 bowel movements a day can be considered normal! (Not socially acceptable, perhaps, but normal under the circumstances). With 15 bowel movements a day one may be said to have diarrhea (I guess!) and with 20 bowel movements a day dysentery is said to be present. Prevention is obtained to some degree by boiling water and using the water purification tablets; however, its advent is almost inevitable. The antibiotics supplied in the survival kits should be utilized in such cases on the assumption that the diarrhea is caused by an infectious agent. Further, simple relief of symptoms can be obtained in a number of ways. Charcoal is effective in stopping diarrhea and can be prepared from the scrapings of burned sticks or bones; bones ground up work in a similar way. In a POW situation the chalk used in lectures may be stolen, chewed and swallowed and if taken in large enough quantities is often effective. The bark of certain trees can be used for the same purpose when boiled to make a gruel-like preparation -- and here again it is important that you be familiar with the local vegetation. Strong tea may be prepared from certain plants and contains the same active ingredient as the bark preparations, namely tannic acid.

WORMS AND LICE

Don't be surprised to find worms appearing at a variety of body orifices since it is difficult to avoid their infestation under conditions of bad food and water, and exposure to human debris which is often unavoidable in POW situations. Personal hygiene is a good preventative measure and one should make every effort to keep clothes and body as clean as possible. This also plays an important role in the maintainence of morale as well. The practical therapy for worms is 1-2 tablespoons of kerosene.... This makes you sick, but the worms get sicker. Such treatment can be repeated if reinfestation occurs.

Lice will be ever present companions even in cold weather and you should make every attempt to pick them off since they are not only potential disease carriers but also have blood-sucking properties. One louse is said to be able to suck 1 cc of blood per day and in terms of "louse-days" this may amount to a considerable blood loss if one is severely infested. You just have to keep after them.

SNAKE BITE

The treatment of snake bite has undergone radical changes in the last few years and some of the old, accepted methods of treatment are no longer applicable and are even considered detrimental. In general snake venom consists of chemicals that are destructive to tissue locally at the bite site and which may affect nerves and blood cells. If you're not sure whether the snake that bit you was poisonous or not, keep in mind that generally a poisonous snake bite will cause local burning sensations, swelling, and redness at the bite site within minutes. Even the bite of a non-venomous snake is potentially dangerous since the bite can become infected.

Let's discuss the current concepts in the treatment of snake bite: (1) Obviously the most valuable treatment for a snake bite will be the utilization of the antivenom for that particular snake. This is the ideal situation which may not always be realized in practice. There are a variety of snakes (in SE Asia for instance) for which there is no antivenom. Where specific antivenom is available (as against the rattlesnake bite) it usually has to be secured from a central source as a dispensary or hospital. Unless it can be made available in a matter of hours, you may not be able to take advantage of its effect. Because there is only a relatively small supply of antivenom for specific snakes and because there is no antivenom at all for a great number of poisonous snakes, none is made available to pilots as part of survival gear. The solution will come with the development of mass-produced, universal antivenom effective against a variety of snakes. As far as antivenom is concerned, then, if you're going to be bitten by a snake, make it a rattler and do it in front of the dispensary!! Well, then, what else do we have for snake bite? (2) The bitten part should be kept as immobile as possible to prevent circulation of the venom. In fact that principle should be applied to the entire body: mountaineers, when bitten by a poisonous snake, knew that if they stayed as quiet as possible (they often just stretched out and went to sleep) they stood a better chance of surviving the bite than if they hightailed it for help. This has been borne out experimentally as well: the more activity you engage in after the bite of a poisonous snake, the less good are your chances. (3) if you have ice or cold water available, local cooling of the bite site impedes the circulation of the venom. (4) The use of alcohol is absolutely out. The combination of the venom and a slug of whiskey is more potent than the venom alone. (Sorry about that!) (5) A tourniquet may be helpful to slow down the circulation of the venom if it is applied above the bite site with only as much pressure as is needed to just indent the skin. That's all the tightness that's needed and that's all that's safe to use. (6) As far as the old standby "cut-and-suck" method is concerned, forget it!!! It has been shown in recent years that such treatment of a snake bite does far more harm than good. Experimentally, when such a method is used in animals after snake bite and compared with a simple immobilization of the animals after snake bite, it has been shown that the death rate and local tissue injury is much

greater among the "cut-and-suck" group!! This is very important to keep in mind: whatever you do or don't do, don't start hacking away at the snake bite. (Besides, who can ever remember where those X cuts are supposed to be made anyway!)

Here, then, we have presented the current thinking on the treatment of snake bite - certainly not a very satisfactory positive solution to the problem and, besides, psychologically difficult, for as it stands now with antivenom generally unavailable and "cut-and-suck" unwarranted and even downright dangerous, all we can do really is to remain as calm and quiet as possible. Or in a nutshell, medically speaking; "masterful neglect."

DESERT SURVIVAL

There are some 69 important desert areas in the world, one of which is 3 million square miles. The possibility of a desert survival situation is not remote as we would perhaps like to think, and this is especially true operating out of Miramar with the desert not too far to the east (and even more pertinent with regular gunnery deployments to Yuma). Obviously the most serious aspect of desert survival revolves around the effects of sun, heat, and lack of water. It may be noted that during the summer months at Yuma the sun temperature exceeds 150 degrees F. and the shade temperature often reaches 120 degrees. In the "cooler" winter months temperatures as high as 120-140 degrees have been recorded on occasion.

Our knowledge of desert survival is derived primarily from the practical experiences of those who have successfully endured such episodes (some 385 cases have been documented) and from experimental work done on the physiology of man in the desert. An analysis of the desert survival cases yields some interesting information:

(1) Time in desert: 1-29 days with an average of five.

(2) Distance traveled from the initial site: 10-350 miles with an average of 50 miles. (Such attempts at "walk-out" are ill-advised since you should remain as close to your initial site as possible unless conditions demand that you move.)

(3) Individuals who strayed from the main party were never heard from again.

(4) The primary hazards were, of course heat, sun, and lack of water but sunglare, cold nights, dust and duststorms were also problems.

(5) Rest during the day and travel at night (if necessary) was effective in maintaining the general physical condition of the parties involved, especially as a means of inhibiting dehydration.

(6) Complete coverage of the body with clothing or some sort of protection was essential. (We can all take a lesson from the Arabs: those long, flowing robes covering the body and head may look goofy in the middle of the desert but actually they function to keep him cooler than if he was even partially exposed because they reduce the rate of evaporation of sweat and therefore reduce dehydration.)

(7) Much difficulty was encountered with sore feet and blisters and only the sturdiest of shoes held up. (The emphasis is again on foot care -- and don't forget those two pair of socks!)

(8) General health was fairly good; food was not a serious problem since with a limited water supply there is little desire to eat.

(9) Water rationing was attempted but in the light of present knowledge was unwise and even futile.

The water problem is obviously of the greatest importance. Some important experimental work has been done in this area, especially in regard to the common notion that one should ration the water available. It has been shown without a shadow of a doubt that man can't be trained or adapted to do without or to use less water by rationing. There is absolutely no advantage in rationing water because the body's requirement for water (specifically the kidneys and the heat regulating mechanism of perspiration) under desert conditions goes on whether or not water is taken in. These basic water requirements aren't lessened just because the available water is cut down. To delay in drinking or to spread a small water supply over a longer period of time only results in more rapidly occurring dehydration which has to be made up eventually anyway. Increasing the intake of water does not increase sweating; so as long as you're thirsty and drink you won't become overhydrated. Water in the man is more economically utilized than water in the canteen! Therefore, as long as you're thirsty, go ahead and drink the water available. It has been conclusively demonstrated that survival time is not appreciably increased until four quarts of water or more are available to the individual per day. The four quarts are approximately the amount of water necessary to maintain water balance for one day at the usual high desert temperatures. Therefore, from what we have just discussed, the gouge is: "Conserve sweat, don't ration water!" And this is obviously accomplished by limited activity, protection from the sun by shade and covering clothing, and by performing necessary activity at night if possible.

Heatstroke or sunstroke, which involves a cessation of sweating and very high body temperatures, is a medical emergency which occurs rarely, if at all, in desert survival. This is because it is the result of high environmental temperatures without letup, and this doesn't occur in the desert since the temperature drops at night. So this shouldn't be a problem.

Heat prostration or heat exhaustion is the result of water and salt loss through sweating under conditions of high environmental temperatures. Here, however, the affected individual will be sweating, will feel cool and clammy and have a rapid pulse -- a shocklike picture. It is not as serious as sunstroke and responds readily to a little shade and some water.

Salt deficiency (heat cramps) is uncommon in a desert survival situation and in the presence of a shortage of water the use of salt tablets is to be absolutely avoided.

Finally, if you're going to be flying over a desert area and the possibility of your having to survive in the desert exists, stay ahead of the game by avoiding spicy or salty foods, alcohol, and coffee before you fly for all

of these are dehydrating agents to some degree. On the positive side take some extra drinks of water before you launch so you'll have a little extra water to "coast on" before you start using your emergency supply.

SEA SURVIVAL

The first phase in this situation will occur as you descend. The MK3C should be inflated. (If your bird has the older style "soft seat," the raft should not be inflated and deployed until you are in the water.) With the new hard seat, of course, your survival gear and raft will be automatically deployed and inflated when you pull the handle on the seat during descent. Once free of the rocket jet fittings in the water, and aboard your raft the second phase begins. The primary problems will be, of course, exposure, limited food and water, and communications.

An analysis of sea survival incidents indicates that 80% of rescues occur during the first 48 hours and the remainder during the next 12 days with few if any rescues made after the first two weeks. The longest recorded raft survival was that of Poon Lin, a Chinese survivor of a torpedoed transport who drifted 131 days on the ship's raft. The longest survival in a flexible raft following escape from an aircraft is 47 days. Since the use of the survival and communication equipment available to you in the raft should be quite familiar to you by now, we'll talk about the more medical of the problems you'll run into, primarily the drinking of sea water.

Seasickness may become a problem in a pitching raft and anti-seasickness pills should be taken. This is a good item to include in your personal survival kit and your flight surgeon will be glad to supply you with the medication. It's well to point out that seasickness with actual vomiting can be a potent source of dehydration besides being physically incapacitating and demoralizing.

All possible means of protection should be used against the elements, especially the sun. Some kind of shade should be established in the raft to prevent sunburn and the dehydrating effects of direct sunlight in terms of increased sweating. If the air temperature is warm enough you should keep the flight suit damp with water during the day to inhibit body evaporation, but you should try to remain as dry as possible during the night to avoid chilling. As on the desert try to keep from being exposed directly to the sun since the combination of sunburn and salt water can cause some uncomfortable sores which are difficult to clear up under these conditions.

Although food is not as critical as water, it still remains a problem. In general the sea is a good source of food since most of the fish from the open sea are edible. Your fishing kit will come in handy here. Some survivors at sea have been able to catch birds as food; plankton, however, which has often been mentioned as a possible food source, has not proven to be a very practical food source and in some cases may be poisonous.

As far as sharks are concerned (like snakebite), there's not much you can do about them. There is no known completely effective shark repellent, although research in this area is quite extensive. The one word that some scientists say describes the shark is: unpredictable!

On this "desert of water" the most critical problem will be that of drinking water. Calculated periods of survival at sea without water vary from about 12 days in an air temperature of 40 degrees F. to 4 or 5 days in an air temperature of 90 degrees F. (Note the similarity of the latter to desert survival times!). If a gallon of water per person is available in the survival kit the survival time will be prolonged by a day or two (just as in desert survival); any less water available than this is of little practical importance and serves only to bolster morale. Beside canned water the desalting kit and solar still are effective drinking water producers. Rain catchment with the tarp is an important method of obtaining water. It should be noted that raw fish or squeezed fish juice is not a practical water source.

Although attempts have been made in the past to prove otherwise, you should never drink sea water, either "straight" or mixed with fresh water to stretch the supply! In the first place salt water is a potent agent in causing diarrhea which is dehydrating (and damned uncomfortable!). Second: sea water contains about 3½% salt, while our body fluids have about 1% salt; the kidneys are primarily responsible for maintaining salt balance in the body and for getting rid of the excess salt, and when working at top efficiency can only put out a solution of about 2% salt. You can see the problem: if you drink the 3½% sea water solution, in order to get rid of the excess salt, the kidneys are forced to draw water from the body tissues to dilute it down to at least a 2% solution so it can be excreted. When you drink sea water then, it almost literally "sucks" the water out of the body, and instead of satisfying your thirst (dehydration) it actually makes it worse! Again, DON'T DRINK SEA WATER!

One final note on drinking sea water: some experimental evidence has shown that in some individuals even relatively small amounts of sea water can cause mental disturbances, while larger amounts have caused marked psychiatric problems and even suicidal impulses. Just one more reason not to touch the stuff.

CONCLUSION

It has been the purpose of this lecture to give useful first aid and survival information to you. Obviously not all the possible topics have been touched on, but it is hoped that this will give you a basis on which to build your own continuing storehouse of such information.

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Flight Surgeon's NEWSLETTER

(This material is for the information of Navy flight surgeons only and does not necessarily reflect endorsement by the Navy or the Naval Aviation Safety Center.)

DRUGS AND FLYERS

Because many drugs decrease the ability of a flyer to stand up to the tough situations that often come with flying, it is important we learn more about them. Any agent that is able to alter the physiologic or psychologic process or character of a flyer should be considered.

As you know, there are some stimulating drugs which will mobilize a flyer's reserve mechanisms and help him withstand unfavorable conditions such as illness, fatigue and even hangover. These should not be used in most circumstances since the mere fact that they are needed reveals a psychosomatic condition calling for a "down" for that flyer. Furthermore, it is not considered wise to extend through the use of drugs the endurance of a "healthy flyer." He is better supported by his own personal hygiene program and by good aeromedical practices on the part of his flight surgeon.

If drugs could unquestionably be expected to correct an abnormality, destroy an infection, alleviate adverse symptoms, such as common headache, back ache or sinus congestions without the harmful side effects that almost every drug is known to have at some time or other, flying performance and efficiency would not be impaired and drugs could be dispensed without restrictions. However, because there are bad side effects, any drug taken by an airman must be closely monitored and medically supervised.

Airmen will self-medicate and this can only be controlled indirectly by a vigorous information program, emphasizing to the flyers that taking these self-prescribed medication may spoil their flying performance and even jeopardize their lives. Common household medication such as aspirin, nose drops, cathartics and vitamins should be discussed. Nose drops, for example, can cause rapid beating of the heart, tremors, body shakes, visual disturbances, such as blurring of vision, blind spots or double vision. Aspirin can cause nausea, ringing in the ears, deafness, diarrhea and even hallucinations. Cathartics, overdosed, can cause fecal leakage of oil or uncontrollable diarrhea, with massive defecation during flight. The results of hypervitaminosis, or taking an overdose of vitamins, (a condition very few non-medical people consider), are excessive amounts of calcium in the blood stream, loss of appetite and loss of weight.

Probably the best general guide for all flight personnel is to leave all drugs alone unless given to them by the flight surgeon or his department. It is not to be denied that there are some symptoms and illnesses that are benefitted by drugs. These beneficial medicines improve flying ability and and ground control work. Often, the use of a drug can be permitted by specifying the exact time before flying is allowed as to so many hours or days after taking

a drug. These time limits are intended to cover a period at which undesirable effects would show up if they are going to appear, especially in a sensitive or reactive individual. Certain group duties would also not be permitted until after a time interval had lapsed from taking certain drugs. The responsibility and duty of the ground operator must be considered.

Sometimes even when a symptom of over dosage or sensitivity for a drug has disappeared, it still does not mean that the person involved is fit for duty. Observing him is mandatory. The medical condition requiring the drug must, of course, also be considered and in some diseased conditions, if the person was ill enough to require drugs, he would still be too ill to fly even though the period of the drug toxicity was past. The physician should check his patient and determine the airman's fitness for duty. Whether some illnesses are treated with drugs or not does not always matter and flying would be contraindicated in any case. The effects of the drug are then of secondary importance.

Sometimes a flyer will go to a physician outside the Navy who prescribes medication without considering or knowing its effects on flying performance. A safeguard for this situation is to have the aviator give the flight surgeon the address and phone of the local physician. Letters outlining the side effects of certain drugs during flight can then be sent to the local physician with a request that he prescribe certain drugs with caution and the aerodynamic effects of the drug be explained to the airman. The large output of new drugs should keep the flight surgeon busy maintaining a periodic appraisal of the latest ones that might be useful in treating pilots.

The dispensing of drugs should always be done on an individual basis. One man's medicine can still be another man's poison. Drugs <u>not</u> to be used for individuals on flying duty are: tranquilizers, anti-hypertensives, anti-cholinergics, anti-histamines and other drugs affecting the psychomotor and sensory functions. Anti-histamines, for example, show a wide variety of individual effects such as drowsiness, mental depression, depth perception loss and dizziness. Loss of motor skills by depression of the vestibular apparatus can also occur.

The antibiotics are extremely valuable in cutting down the time away from flying as a result of an infection. Because they are not available for self-medication, these drugs can usually be controlled by the flight surgeon. Streptomycin and chloromycetin require special consideration. Streptomycin can cause vertigo, deafness and symptoms of 8th nerve damage. Chloromycetin can cause anemia and damage to the oxygen carrying capacity of the blood.

--- CDR Sverre John Oftedal, MC, USN
SMO, USS LEXINGTON (CVS-16)

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SELF-IMPOSED DIET DROPS PILOT'S BLOOD PRESSURE

Dieting can result in a reduction in various physiologic functions which are extremely important to aviation personnel. This report of orthostatic hypotension following a crash diet was prompted by a comment in a recent Flight Surgeon's Newsletter (Pearl #1, FSNL, 7-65).

In our A.V.R. we recently encountered a 23-year-old aviator who had been on a self-imposed diet in an attempt to be under his maximum weight at the time of his annual flight physical. He stated that he reduced his weight by 15 pounds over a 2½ week period, using "about a 500 calorie" diet.

Early in his physical examination, during the Schnieder Circulatory Rating, it was found that his blood pressure fell from 135/80 recumbent to 115/55 standing. The initial fall was greater; the 115/55 value was obtained after three minutes of upright posture.

We had this man return every morning for one week for repeat Schnieder's. He was instructed to return to a "normal" diet, get adequate sleep, and be moderate with regard to smoking, etc. It required FOUR days for him to maintain his blood pressure when changing to the upright posture. The remainder of his physical examination, EKG, etc., was normal.

Most authors agree that the diastolic pressure should increase several mm. of Hg or at least maintain its value when changing to the upright position. The systolic pressure evidently is less predictable; it may increase or decrease slightly or remain the same and be considered normal. This does vary slightly with the specific criteria of the Schnieder Test.

The explanation for this abnormal response to postural change is most likely dehydration with a resultant decrease in blood volume. He could barely tolerate the stress of one G in the upright position. If he had been flying a high performance aircraft and had encountered additional positive G, -- the results would need little additional comment.

The so-called crash diets result in a host of physiologic abnormalities, only orthostatic hypotension being mentioned here. Others are more subtle, less easily discovered and can be equally as important. We agree with your conclusion that proper stimulation toward physical conditioning over the years should be the goal rather than crash efforts.

-- W. H. GAASCH, LT, MC, USN
Staff, COMNAVAIRPAC

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In flying as in medicine, one uses past successes as the best indication for a particular course of action.

-- Theodore I. PUTNAM, LT, MC, USN
3rd MAW, MCAS, El Toro
(Comment from MOR)

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ITEMS 6 AND 6D OF SEEK-1 SURVIVAL, ESCAPE AND EVASION KIT

John W. AVERY, PR1, FAETULANT, Det 1, recently brought to the Safety Center's attention the fact that Items 6 and 6D of the SEEK-1 Kit, salt tablets and methamphetamine tablets respectively, are similar in color, shape and packaging and nearly similar in size. Due to these similarities, it is conceivable that the two drugs could be interchanged, especially during periods of stress when the kit is most likely to be used. The Safety Center has recommended to the Navy Aviation Supply Office that action be taken to change the color and packaging of one of these drugs to avoid possible confusion in use.

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TROPICAL LAND LEECHES

A number of inquiries have been received at the Naval Aviation Safety Center seeking information on methods of repelling land leeches. These small parasites are common in the rain forests of Southeast Asia. They are especially troublesome during the monsoon season.

Land leeches reach the human host from foliage and grasses or they may climb up a person's legs from the ground. Once on a person, they quickly find openings in the clothing and reach the skin where they attach themselves by suckers. The anterior sucker contains the mouth which is fitted with small cutting teeth used to pierce the skin of the host. Once the skin has been pierced, the leech secretes hirudin, an anitcoagulant, which facilitates bleeding. The animal engorges itself with blood, then drops off the host.

The bite of the leech is painless and persons are often unaware that they have been bitten. The only medical problem concerns secondary infections which may arise at the puncture site, especially since these lesions are slow healing. Some individuals develop an allergic reaction and experience severe itching at the lesion site. To those who have never had experience with land leeches, much needless anxiety is aroused at the thought of being exposed to these parasites. This is undoubtedly due to vivid imaginations fed by exaggerated tales from individuals who have second and third hand information reinforced by memories of science fiction stories.

Land leeches are easily removed by pulling them off, touching them with a lighted cigarette or applying table salt, or gasoline, vinegar or any other strong solution. They can be repelled by using the standard stock insect repellent (FSN-6840-753-4963). The repellent should be applied liberally to all exposed skin. It is also wise to apply it to the waist and legs.

Readers are urged to refer to BUMED Instruction 6250.10 for additional information concerning the use of the repellent.

— CDR L. R. KAUFMAN, MSC
Head, Environmental Health Divis

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SOURCES OF TRAINING MATERIAL

Some flight surgeons have experienced difficulty in locating sources of current training material in the field of aviation physiology. The Navy has good material in this field, various drug companies supply such and there is a list in the Physicians' Desk Reference. Here is a partial list of sources supplied by LT Chuck COLE, MSC, USN, assigned to the Low Pressure Chamber, NAS, Norfolk:

Aeromedical Reviews, Dysbarism 1-64
Air Force Manual 52-13, Physiological Training.
Armstrong, H. G. (1961) Aerospace Medicine, Williams and Wilkins, Baltimore, Md.
Brown, H. H. U., Physiology of Man in Space, Academic Press, New York and London.
Gantz, K. F. Man in Space, Duell, Sloan, Pearce, New York.
Medical Service Air Force, Physiology of Flight, Pamphlet # 160-10-4.
NavPers 10839, Aviation Medicine Practice.
NavExos p-1260, Instructor's High Altitude Physiology Training Manual.
Van Liere, E. J., Hypoxia, University of Chicago Press.
Astia Document AD 207780, Vision in Military Aviation.

Journals:
"Journal of Aviation Medicine"
"Aerospace Medicine" - Aerospace Medical Association, Washington, D. C.
"Aeromedical Reviews" - USAF School of Aerospace Medicine, Brooks AFB, Texas

1310 Medicine and Surgery and Aviation Medicine

Navy Code Number	Time	B/W or Color	Film Title
MN 2361	42	B/W	"G" and You
MN3446	37	B/W	The ABC of "G"
MN6937	27	B/W	Navy Flight Surgeon
MN 8379	23	C	"G" Facts
MN 8181	26	B/W	First Aid for Axphyxia
MN 9480A	25	C	Vision in Military Aviation-Sense of Sight
MN 9480B	17	C	Vision in Military Aviation-Illusions
MN9480C	20	C	Vision in Military Aviation-Inflight Recognition
MN9480D	20	C	Vision in Military Aviation-Errors in Vision
MN9630	20	C	High Pressure Gases in Av...

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PEARLS....

1. Our attempts to provide a "Let's Keep in Contact" section in the Flight Surgeon's Newsletter have met with approval by the readers. Will the SMO at each activity please send us a write-up for publication? Identify flight surgeons by class number if possible. Please contribute NOW!

2. "Tropical Land Leeches" was written by CDR L. R. KAUFMAN, MSC, USN, an Environmental Health specialist assigned to the Aero-Medical Department. He will be doing work in his field as related to aviation and also outlining a future study into all aspects of Fatigue in Naval Aviation.

3. CDR Walt CABLE, MC, USN, has now arrived at the Safety Center. Look for his article and write him here, Code 46. Welcome aboard, Walt.

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ENCLOSURE 1

WATER FOR SURVIVAL

Ray D. Jackson and C. H. M. van Bavel

WCL Report 4

30 June 1965

A simple desert survival technique utilizing sunlight for distilling water from soil and plant materials

UNITED STATES
WATER CONSERVATION LABORATORY
Soil & Water Conservation Research Division
Agricultural Research Service
United States Department of Agriculture
Tempe, Arizona 85281

Enclosure 1
to FSNL 9-65

WCL REPORT NO. 4

WATER FOR SURVIVAL

Ray D. Jackson and C. H. M. van Bavel [1/]

INTRODUCTION

People stranded in desert areas are frequently without a source of water. This report describes a simple device called a "survival still" that utilizes a plastic sheet and sunlight to distill drinkable water from soil and fleshy plants such as cacti. The plastic sheet can be folded and carried in a pack or pocket. The still consists of a bowl-shaped hole in the soil about 40 inches in diameter and about 20 inches deep which is covered with a plastic film formed and held in the shape of a cone by a rock placed in the center. Sunlight passes through the plastic and is absorbed by the soil and plant material, resulting in evaporation of water, followed by condensation on the cooler plastic. The water drops form on the under side of the plastic, run to the point of the cone, and drop into a container placed directly under the rock.

The survival still is intended only for emergencies. One still constructed in a moist clay soil will yield three pints of water per day. A still constructed in much drier soil such as that usually found in the desert may yield about 1/2 pint per day, but if it contains cut pieces of fleshy plants such as cactus, it will yield about three pints of water per day. Three pints of water per day may not be enough to enable a person to survive indefinitely. It will, however, prolong survival and thereby increase his chances of being alive when found. With two or more stills per person in areas where fleshy plants, sea water or brackish water are available, a person could have an adequate water supply. In situations where the soil is extremely dry and no fleshy plants are available, little, if any, water will be obtained from the soil. In these situations, the still can be used to purify polluted water such as body wastes.

Details of the technique are given in the following sections.

PARTS

The essential parts of the survival still are a piece of plastic film about six feet square and a container or any waterproof material from which a container can be fashioned. A 4-quart bucket is convenient but a container can be made from such materials as plastic, aluminum foil, and canvas. A convenient, but not essential, part is a piece of plastic tubing about 1/4 inch in diameter and four to six feet long. The tubing can be fastened to the bottom of the container and water removed for drinking without disturbing the plastic.

Almost any clear plastic film will work. However, some will work better than others. The plastic film should be clear, strong, and "wettable." Being "wettable" is important. This means that water drops that form on the under side of the

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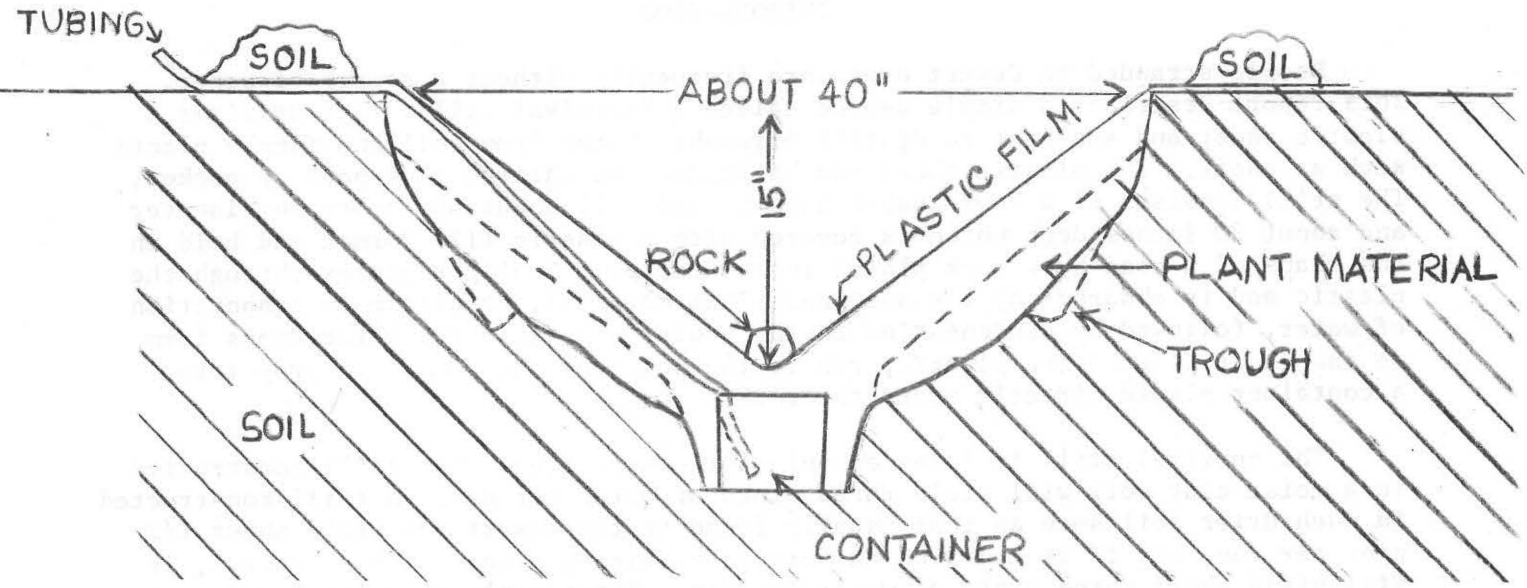
[1/] Research Physicists

plastic will cling to the plastic as they run down to the container. If a plastic is "non-wettable" the drops will form, but many will drop off before reaching the container. The difference between "non-wettable" and "wettable" plastic is similar to the difference between a newly waxed automobile and one that hasn't been waxed for some time. When water is put on freshly waxed (or "non-wettable") automobiles, the drops are large and don't spread out. On the older (or "wettable") finishes, the water spreads out and runs off rapidly.



Some plastic films can be treated to be more wettable by careful scratching with wet sandpaper or possibly by a thorough scrubbing with a scouring powder. The tiny scratches help the water to cling to the plastic while it runs to the container. The scratched side must be down.

A plastic film that is clear, strong, and sufficiently wettable to require no further treatment is duPont's "tedlar," 2/ 0.001 inch (1 mil) thick (number 100 BG-30). If a plastic is to be used that requires scratching, a thicker film (possibly 3 or 4 mil) may be required.

CONSTRUCTION

Refer to the diagram of the survival still (above). Dig a bowl-shaped hole in the soil about 40 inches in diameter and about 20 inches deep. If a shovel is not available, a flat rock or a stick can be used to loosen

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2/ Trade names and company names, when included, are for the convenience of the reader and do not indicate preferential indorsement of a particular product or company over others.

the soil, and the soil can be removed by hand. Additional excavation may be required in the center of the hole to accommodate the container. If the container is to be a plastic or canvas sheet, this additional excavation can be shaped to give support to the container. If polluted water, such as body wastes, is to be purified, a small trough can be dug around the side of the hole about half way down from the top (see diagram). This trough is to insure that the soil wetted by the polluted water is exposed to the sunlight (see section PRECAUTIONS). Without the trough the water may run down around or in the container. If plant material such as cactus is to be used, cut the plant into pieces and line the sides of the hole with the pieces.

Next place the plastic film over the hole and put a little soil on the edge to hold it in place. Take a rock about the size of your fist and place in the center of the plastic. Push down on the rock until it is about 15 inches below the soil surface. The plastic will now be in the shape of a cone. Put soil on the plastic around the rim to hold it securely in place and to prevent water vapor losses. Straighten the plastic so it forms a neat cone. The plastic cone must have an angle of about 30 degrees in order for the water drops to run down to the container.

LOCATING THE STILL

Location of the still depends upon whether or not cacti are available. If cacti are available or if polluted water is to be purified, the still can be constructed in any convenient spot where it will receive direct sunlight throughout the day. Ease of digging the hole would be the main consideration here.

If the soil is to be the only source of water, some sites will be better than others. In this case, locate the still in a stream bed or a depression where rainwater collects. The more water that soaked into the soil during and after the last rain, the better the yields will be. Generally, a clay soil is better than a sand because it holds more water longer. After prolonged periods without rain, the yield from soil alone may be small.

Although a clay soil holds more water than a sand, a wet sand should work very well. Along a sea coast where fresh water is not available, a still could be constructed above the high water level. If a site is not available on the beach, a still could be constructed on higher ground and the soil soaked with sea water periodically. After a few days the salt accumulation on the soil surface may reduce yields. If so a new hole could be dug a few feet away. In an inland area where brackish or polluted water is available, the same principle could be used.

PLANT MATERIALS

Cacti contain considerable amounts of water even after prolonged periods of drought. Barrel, saguaro, and prickly pear can be cut in pieces and placed around the sides of the hole under the plastic. Water can be obtained from most fleshy plants, but the yields from woody, small leafed plants such as creosote bush will be small.

YIELDS

It takes about one hour for the air under the plastic to become saturated and water collection to begin. Under good conditions one pint of water can be expected in six hours. Three pints of water per day can be obtained from a still constructed in a damp, clay soil. From a dry desert soil, the yield may be 1/2 pint or less. From the same desert soil with cacti in the hole, three pints per day can be obtained. Generally, the yield will be two pints during daylight hours and one pint at night. On cloudy days the yield will be reduced because sunlight is necessary for the still to operate.

PRECAUTIONS

When using polluted water make sure that none is spilled near the rim where the plastic film touches the soil, otherwise there is a chance of contamination. Make sure none comes in contact with the container.

When cacti are used, make sure that the cut pieces do not touch the plastic, otherwise the water may taste slightly of the cactus.

Do not disturb the plastic sheet unless it is absolutely necessary. If a tube is not available to drink directly from the container, lift the plastic and remove the container as few times as possible. It takes from 1/2 hour to one hour for the air to become resaturated and the collection of water to begin again after the plastic has been disturbed.

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ENCLOSURE 2

The following material outlining some of the Navy's research work should be of general interest to all flight surgeons:

HISTORY OF THE AVIATION MEDICAL ACCELERATION LABORATORY
OF THE U. S. NAVAL AIR DEVELOPMENT CENTER, JOHNSVILLE, PA.
From 1 January 1964 through 31 December 1964
(Redesignated the Aerospace Medical Research Department as of 1 July 1965)

The primary functions of the Aviation Medical Acceleration Laboratory are to conduct research in the general field of aviation medicine, physiology, biophysical effects of acceleration forces, aviation human engineering; develop, improve, test and evaluate aviation personnel equipment and aircraft components. To accomplish these functions and support the operation of the human centrifuge, the Aerospace Medical Research Department is composed of the following Divisions: Biophysics and Bioastronautics; Biochemistry; Aviation Medicine; Physiology, Psychology; Engineering; Administrative; Library.

During 1964 the centrifuge modification program was completed at a cost to date of 2.3 million dollars. The new 50-foot human centrifuge consists of a 4000 H.P. vertical D.C. motor with a 50-foot tubular steel arm and a spheroidal type gondola mounted in a two gimbal support. Provisions have been made for a removable third gimbal control of the gondols. At 50-foot radius operation a maximum of 40 G can be obtained at a rate of 10 G/per second to 15 G and 5 G/per second thereafter. At 22-foot radius operation a maximum of 100 G can be obtained. The gondola payload in the new centrifuge is 1000 pounds or 40,000 G pounds.

A new addition to building #70 was started in June. The new building will provide an additional 2,700 square feet of laboratory space.

The following are accomplishments of each Division during the year 1964.

Aviation Medicine Division: During the past year, the Aviation Medicine Division has continued its basic functions of medical monitoring, collaborative support of other research divisions, as well as initiating and prosecuting its own research projects. Adverse effects of acceleration continues to be a major area of research, with particular emphasis being placed upon pulmonary function. Basic work on blood oxygen mechanisms has been carried out with a report given at the 35th annual meeting of the Aerospace Medical Association. Additional studies of pulmonary perfusion as affected by acceleration are in the planning stage.

Anti-G suit evaluation, and testing of the new A-7A ejection seat (both in cooperation with ACEL - Philadelphia); medical support of NASA Gemini programs; development of a litter restraint system in cooperation with FAA and EDL, NADC; and participation in the FAA flight-turbulence study at AMAL, are some of the joint exercises participated in by members of the Aviation Medicine Division. In conjunction with the pulmonary function studies as affected by acceleration, visits have been made to Johns Hopkins University, and the Institute of Aviation Medicine, RCAF, Toronto, Canada. The Director of the Clinical Biochemistry Laboratory,

Rockefeller Institute, New York, spent two weeks on active duty as a medical officer at AMAL. The Aviation Medicine Division continues its role in research, and cooperation with other units, in meeting operational needs for the Navy and other governmental agencies.

Physiology Division: During the past year the Physiology Division has developed an AM-FM biotelemetry system which transmits physiological data from the subject's person. Electroencephalogram, electrocardiogram, respiration, and six body temperatures are monitored. A special electrode system permits a high degree of mobility for the subject without severely interfering with the quality of the signals received, and the electrodes can be worn for at least a week without irritating the skin. No special electrode paste or skill is required to apply electrodes to the subject's skin. Special processing of the electroencephalogram permits its use as an index of the subject's general level of alertness and visual attention.

We have recently shown, by ablation and by local heating and cooling, that tissue influencing metabolic rate is located in the preoptic region of the brain of the cat. Injection of Y-OH-sodium butyrate (pH 7.3) into the preoptic region or anterior hypothalamus of cats reduced oxygen consumption by 28-47%. Metabolism began to slow after injection of 0.01 ml. of 0.15M solution whether given in a single or in divided injections. Colonic temperature began to fall within a few minutes and continued to fall as long as injection continued. Injection was stopped as soon as colonic temperature fell below 36°C. Cutaneous vasoconstriction did not occur, even at body temperatures as low as 35.5°C, until injection was stopped and metabolic rate began to increase. Slowing of metabolism was associated with somnolence from which the animal can be readily aroused. Injections at the same sites of equal or greater volumes of 0.15M NaCl were either ineffective or appeared to increase metabolism. Identical effects could be produced by oral or intravenous administration of 5-11 ml./kg. of 0.3M Y-butyrolactone. This substance holds promise as a possible sedative for astronauts during space flight.

Biophysics and Bioastronautics Division: During most of 1964 the Biophysics and Bioastronautics Division continued along past lines conducting research in acceleration protective devices, providing simulations of flight accelerations, and operating, maintaining, and developing the control circuitry of the centrifuge. Toward the end of the year the Division was reorganized to encompass the former Thermal Laboratory as a Branch, continuing all its functions and to establish a Mathematics Branch devoted to representation and development of biophysical theory derived from experimental data.

Thermal Branch: The efficiency of the inherently fire-resistant polyamide fiber "Nomex" in fire-protective gear has been firmly established as anticipated last year. An evaluation on the protection capability of the fire-resistant cotton was made possible by a helicopter crash fire. The evidence shows that the polyamide fabric afforded protection to the pilot by resisting ignition whereas the cotton contributed to the fire hazard by igniting. This material is now in use in many fields. A patent has been awarded on the flame contact heat analyzer apparatus developed for

this work. Preliminary results utilizing the heat analyzer and a high-intensity radiation source in application of heat transfer principles favor the use of the polyamide material in the development of protective clothing for the nuclear weapons delivery pilot. In the work on burning characteristics of fabrics in oxygen-enriched atmospheres additional study has confirmed the damping effect of nitrogen and established a similar and slightly more potent effect of argon. Research continues in these fields while development efforts are directed principally towards improvement in comfort features of protective personal gear.

Operations Branch: A major function of the Operations Branch is to program, operate, maintain, and modernize the human centrifuge as a dynamic simulator. The modernization of the centrifuge which started over five years ago was essentially completed this year with the installation and checkout of a new arm and gondola. Some of the more significant features of the modernized centrifuge are: an interchangeable capsule concept which will minimize downtime between programs; a new centrifuge arm and gondola capable of accommodating larger and heavier payloads; new slip ring stacks at all axes capable of transmitting more physiological, psychological, and engineering data to and from the gondola during programs; an increased number of rotary joints capable of commuting conditioned air, vacuum, hydraulic fluids, and compressed air to the gondola; and increased programming and control capabilities of the centrifuge and gimbal drive motors.

In spite of the four and one half months downtime necessitated by this installation, the following centrifuge programs were accomplished during the year using in house simulation and control capabilities furnished by the Operations Branch:

1. Medical studies including the oximeter and diffusing capacity and the nitrogen wash-out projects.
2. Centrifuge physcopharmacology phase II, with Rutgers University.
3. Validation study of flight turbulence simulation for FAA.
4. Ejection seat, shift of C.C. study, with ACEL.
5. Gemini, phase II, with NASA.

The success of the Flight Turbulence Validation study demonstrated a new avenue of simulation on the centrifuge.

In keeping with the expanded facility, the Operations Branch has been granted a new Bureau of Medicine sub-task entitled "Advanced Computational Studies in Support of Acceleration Research."

The Operations Branch has continued to furnish health physics services for NADC.

Biochemistry Division: Continuing the work on the control of biological energy via neurohormonal regulation of excited state intermediates a free radical was found generated in both nerve and brain by a mechanism known to trigger nerve impulses in-vivo. Isolation experiments made possible the resolution of the reaction to the formation of a charge transfer complex between an activator dye molecule and a nucleoprotein. Norepinephrine apparently became an essential component for the generation of the free

radical in the isolated system. This work offers new approaches (a) to the mechanism of action of neurohormones, (b) to the conductile process in nerves and (c) to a possible simple molecular memory model in brain.

A soluble enzyme system associated with mitochrome has been isolated from mitochondria which apparently couples phosphorylation with an electron transfer step. With DPN and cytochrome 555 the mitochrome complex reduces the cytochrome. Upon addition of adenosinediphosphate, Mg^{++} and inorganic phosphate the cytochrome in immediately reoxidized and inorganic P is esterified to ATP. The reactions are interpreted to indicate an electron transfer phosphorylating shunt with redox reactions taking place between the respiratory enzymes and the purine ring moiety of nucleotides tightly bound to the enzymes. These studies are considered important in that they offer some understanding of the mechanisms for energy transformations from oxygen uptake reactions in stress states.

Engineering Division: The Engineering Division accomplished the following assignments during the calendar year 1964:

The Fabrication Branch completed over 125 work orders. This total does not include the many emergency jobs that required immediate on-the-job repairs. Mechanical services were provided for the various departments of the AMAL (Thermal Branch, Vision Branch, Instrumentation Branch, Physiology Division, Human Factors Branch, Biochemistry Division, Aviation Medicine Division, Operations Branch, and the Engineering Division). All of these work orders were effected through direct liaison between scientist and modelmaker machinist. The work comes to the Fabrication Branch through sketches and/or verbal discussions, and as the job is developed, there is continuous personal communication between the people concerned to determine the optimum design of the project equipment - the designer fabricator with his many years of practical experience and the scientist with his professional requirements of the end product....

The Instrumentation Branch supported the AMAL/Rutgers Drug Study; the AMAL investigation related to the gaseous content of human blood in-vivo with a subject undergoing centrifugation; the Federal Aviation Agency Turbulence Study; the AMAL/ACEL displaced center of gravity project; and the NASA Phase II Gemini Training Program. All these involved the design, construction, and installation of circuitry required to provide the measurement, management, and acquisition of the complex information going into the centrifuge gondola for the astronaut's task and his responses coming out of the gondola for recording and storage. In addition, the Instrumentation Branch monitored the installation and acceptance testing of all instrumentation devices during the centrifuge modification period. The McKiernan Terry Corporation designed and installed a gas handling rotary joint in the outer and inner gimbals. These presented a fire hazard if used on the Gemini full-pressure suit environmental system. The Engineering Division designed, constructed, and installed new rotary joints in these gimbals capable of handling oxygen safely.

A data acquisition system was designed and developed which would provide a simplified automatic high speed readout of centrifuge project data. Satisfactory results have been achieved in the recently designed instrument servo units and these will be available for future proposed projects.

Preliminary design has been completed for a variable force aircraft control stick to provide realism in centrifuge simulations. The first use of this control stick will be in the FAA Turbulence Study.

The Engineering Division designed, constructed, and installed all centrifuge simulation fixtures required for AMAL generated projects. All other agencies sponsoring centrifuge programs required the participation of the Engineering Division in the preliminary design of centrifuge simulators and its approval of the final design. An example of this was the McDonnell Aircraft Corporation's centrifuge fixture ot fit into the new spherical gondola.

In the past it was the responsibility of the Engineering Division to maintain a history of all mechanical anomalies occurring to the centrifuge arm and gimbal system. To pursue this responsibility, they conducted periodical non-destructive maintenance testing of the centrifuge. This mechanical supervision will be continued on the new centrifuge except that the contracted Magnaflux services will be replaced by Engineering Division personnel performing dye-penetrant inspections of all weldments. Future plans call for the Engineering Division to establish a stress-monitoring analysis of all potentially critical centrifuge programs.

Psychology Division: In June 1964, the Psychology Division at AMAL started active participation in the formulation and development of the Navy MOL P-13 Ocean Surveillance Experiment as a part of the Defense Department Manned Orbital Laboratory Program. Later in the year, this experiment was accepted as one of the primary experiments to be performed in the proposed Manned Orbiting Laboratory. During the latter part of the year, the Psychology Division prepared the written sections of the Navy MOL Documentation on human factors, test and evaluation, biomedical measurements, astronaut training, experimental design, experiment analysis, performance analysis, and simulation. Personnel from the Division were assigned to support Navy MOL program requirements in cooperation with the Navy MOL Program Office at NADC and at the USAF Space Systems Division in the following technical areas: simulation and training, human factors, human measurements, and experimental design.

Biomechanics Branch: A preliminary program was completed to determine the usefulness of powered exo-skeletal systems in increasing human tolerance and performance capabilities in high acceleration environments. The Handyman Remote Manipulator, built for the Atomic Energy Commission by the General Electric Company, was used as the test vehicle. The local control harness was mounted on the AMAL human centrifuge. A servo system was constructed to sense the vertical acceleration and to introduce a compensating signal to the joint mounted actuators. The subjects reported less fatigue while performing tasks with the arms and hands at levels to 3 G while in the harness than while not in it.

As a follow up to the Handyman Program, a contract was let to the General Electric Company to build a servo-restraint system for one joint to operate at levels up to 25 G. Phase one of this contract, a study phase, was completed. Phase two, the construction of a revolutionary new hydraulic servo valve to be acceleration actuated, is in the final stages of completion.

A gas actuated, aircraft type, seat mounted pull-back harness was tested. Forces of up to 1,000 lbs. were used on the shoulder straps. Pull-back times of about 0.25 seconds were obtained. Further tests of this device, built by Pacific Scientific Company, will be made on the human centrifuge.

A program on plastic foam inflated flight suits was completed. These suits are made of lightweight, porous, two-layered cloth. A plastic foam can be injected between the inner and outer layers. This foam provides flotation and warmth in the event of forced exit from the aircraft over water. It was determined that the present techniques of inflation are inadequate to prevent thin spots and voids in the garment.

Work on the vestibular function research truck continued. A mathematical analysis of the paths the truck is to follow to produce the desired results was completed.

Human Factors Branch: Data collection was completed upon a carefully controlled study of man's ability to orient with respect to the gravitational vertical. Water immersion was utilized to provide equilateral support of the subject while positioned upon a tilt-table. Extensive development effort was required to provide proper breathing equipment and to eliminate the extraneous cues of temperature, sound, and bubble motion.

The second Gemini centrifuge simulation program was completed. Twenty-eight subjects experienced the accelerations of launch, launch-abort at three points, and reentry. This program provided training for the primary and back-up crews for Gemini GTIII and GTIV as well as orientation experience for the 14 newly-appointed astronauts.

Plans were completed for a detailed dynamic simulation of swept-wing transport aircraft. This simulation, funded by the FAA, is designed to study the role of the pilot and should have excellent potential for profitable application in a number of environments involving vibration/acceleration exposures.

At the request of the Anti-Submarine Warfare Laboratory, the Human Factors Branch proposed a recommended design for crew placement within the P-3 ASW aircraft. The primary aspects of the proposed design were adopted and mock-up verification is underway.

Considerable Branch effort was devoted to the support of the planning phase of the Navy's experiment within the Manned Orbiting Laboratory.

Basic investigation was begun, through contract to Purdue University, into the area of sensory translation; the use of an alternate sensory modality for the transmission of information. This work, going far beyond the fly-bar application, should provide information enabling the design of systems with a "sensory back-up" capability.

Efforts were begun to integrate the existing compliment of data processing and compiling equipment within the Branch into a more workable complex in preparation for the move to new facilities in the new wing.

Experimental Psychology Branch: During 1964 several operant conditioning experiments were performed and the data presented in scientific journals and in NADC reports. Two studies analyzed behavior under fixed ratio and variable ratio schedules of reinforcement. The displacement as well as the durational characteristics of behavior were measured and analyzed. One procedural paper describes a preferred method for plotting and analyzing cumulative response curves.

A project on psychophysics was initiated in July 1964. This project has three purposes: (a) to relate the method of limits and the method of constant stimuli so that data obtained by either method may be transformed to the format of the other method, (b) to provide a theoretical framework for evaluating the effects of procedural variations on threshold measures, and (c) to point out the incompatibility of present-day assumptions concerning psychophysical measurements.

Vision Branch: During 1964, the efforts of the Vision Branch have been devoted to the problem of flashblindness from special weapons and related problems. A laboratory study has been conducted on the relation of light adaptation and pupil size to recovery time from flashblindness. This type of research has been hampered in the past because of the high luminances required. In order to alleviate this problem an extensive increase has been made in the capabilities of the instrumentation of the Vision Branch.

Research and development of flashblindness protective devices have been directed to the support and monitoring of contractors effort on the photochromic type device. In state-of-the-art engineering prototype of the photochromic device is being developed while further research to improve the photochemicals is continuing.

Personnel of the Vision Branch have participated in the designing and planning of Project 4.1, Operation Blue Rock and are now performing the tasks necessary to fulfill the Bureau of Naval Weapons project requirements.

At the request of AF-NRC Vision Committee, the Vision Branch participated in a seminar on flashblindness. A paper was presented on the characteristics of weapons flashes as they pertain to flashblindness by Drs. J. H. Hill and Gloria T. Chisum. A review paper on flashblindness problems was presented at the AIRCENT Medical Officers Conference in Fountainebleau, France by Dr. Hill. This paper also is being published in Navy Technical Form at the request of the editor.

Subsequent to the publication of the 1964 History, the Aerospace Medical Research Department has performed additional centrifuge experiments:

1. Developed a new universal "G" couch adaptable for pilots or astronauts in the various percentile groups.

2. Tested a new seat-restraint system for BuWeps to increase pilot capability during low-level turbulent flights.

3. Performed a research project on autonomic-labarynthine responses of acceleration, using biochemical measurements of nor-epinephrine, free fatty acid and blood sugar of both normal and labarynthine-defective subjects exposed to both linear and angular accelerations.

4. Studied pulmonary perfusion as affected by transverse acceleration.

The biochemistry, physiology and biophysics divisions continue to pursue basic research, as well as meet operational needs for the Department of Defense.

Captain E. M. WURZEL, MC, USN, is the Aerospace Medical Research Department's present director.

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Flight Surgeon's NEWSLETTER

(This material is for the information of Navy flight surgeons only and does not necessarily reflect endorsement by the Navy or the Naval Aviation Safety Center).

NASC AVIATION PATHOLOGIST'S ASSISTANCE AVAILABLE

CDR Walt GABLE has finally completed checking-in, getting the family settled down, etc. He is now ready to accompany the Accident Investigation personnel on accidents which require the services of an aviation pathologist. In addition, if no accident investigator is dispatched from NASC but the flight flight surgeon feels that an aviation pathologist is essential to the investigation such requests will be given due consideration. During working hours, 0800 - 1630 EST, Dr. Gable can be contacted at 444-3321. After working hours, the duty officer at NASC can be contacted at 444-4331 and he will inform you where to get in touch with Dr. Gable.

In all fatal aircraft accidents it is desirable to have an aviation pathologist assist the flight surgeon in the investigation. At present due to the limited number of persons having aviation pathology training this is not possible. Therefore, the utilization of the aviation pathologist must be limited to selected accidents. Fatal accidents resulting from unsuccessful ejections, equipment failure, toxic products, and hypoxia and thos e which are unexplained represent examples of the types of accidents in which it is particularly desirable for Dr. Gable to assist. It is emphasized that these are examples and do not necessarily represent an absolute limit in the scope of operation of the NASC Aero-Medical Department Pathology Division. If any problem arises in this area get on the phone and call NASC so that a solution can be reached before valuable time and information are lost. Also keep in mind that any questions you may have pertaining to aviation pathology can be addressed to:

CDR W. D. GABLE, MC, USN
Aero-Medical Department
U. S. Naval Aviation Safety Center
U. S. Naval Air Station
Norfolk, Virginia 23511

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OCCUPATIONAL HEALTH HAZARDS

The following items are from BuMed's Occupational Health Hazards Release No. 42.

Ketones - An aircraft painter complained of nose and throat irritation from brush application of sealer to the inside of aircraft wheel wells. The solvent is a blend of Ketones and in poorly ventilated operations of this type can be a nuisance. This job requires a respirator but the employee had failed to use the proper precautions.

Red Lead - In the formulating of a dummy, casting powder red lead was employed. On the first day of operation, employees were observed working in an obviously dusty environment without respiratory protection. Supervision was promptly alerted to this malpractice and respirators were supposedly worn for the duration of the operation (two weeks). Air samples were not taken. Urine specimens were obtained after the first week and upon termination of the operation. As per NCPI 792, for evaluating lead exposures, porphyrin determinations were performed on the two sets of urine samples. All of the porphyrin results were negative. However, lead-in-urine determinations were performed on the final set of urine samples. For the 10 urine samples, the distribution of results were as follows:

High - 0.567 mg/1 Pb
Average - 0.297 mg/1 Pb
Low - 0.144 mg/1 Pb

The above results indicate that significant exposures were encountered via the inhalation and/or ingestion route. The porphyrin test has long since been known to be obsolete and useless as a reliable test for lead. Other tests, such as blood and urine lead determinations are preventive tests and will indicate that, uless controls are exercised, lead poisoning will result. A program has been initiated for periodic blood lead determinations in addition to the porphyrin test for those employees engaged in lead operations.

Trichlorethylene - Personnel exposures to vapors of trichlorethylene in the teletype repair shop were investigated at a naval communication station. The vapors were released into the atmosphere during the operation of a solvent cleaning cabinet. The unit consists of an inner chamber in which the parts are slushed, then rapidly spun in a trichlorethylene bath. The parts are then moved to an upper chamber in the cabinet and are dried with compressed air. The cabinet inner chamber has a hinged lid which is kept down during the cleaning cycle. The outer unit doors are also kept closed except during the drying operation. The upper portion of the cabinet is equipped with a fan and duct exhausting to the outdoors.

Under all operating modes the vapor concentrations of trichlorethylene were grossly in excess of the threshold limit of 100 ppm. At the cabinet, the concentrations were from 350 ppm to 1500 ppm. In the portions of the shop, 50 feet from the cabinet concentrations of from 75 ppm to 200 ppm were common.

The personnel in this shop complained of frequent episodes of nausea and dizziness. It was recommended that an airflow distribution baffle be installed in the back section of the cabinet and that an exhaust fan capable of producing a minimum of 125 lineal feet per minute per square foot of cabinet opening be installed instead of the totally inadequate fan used at the time of this study. Instead of compressed air blow-off, a hot air drying chamber was suggested for use inside the cabinet. The hot air supply tube was to enter this inner chamber from outside the cabinet and spent air was to be released from the inner chamber through several small openings into the ventilated cabinet compartment.

These recommendations were carried out. Follow-up survey revealed that the modified system completely eliminated trichlorethylene vapors from the shop. Tests for trichloracetic acid excretion in the urine of the shop personnel were all negative after installation of the recommended changes.

Epoxy Resins - Epoxy resins are being developed for use in the repair and resurfacing of cement floors. These materials are definitely recognized as inhalation and skin hazards. One major project involved resurfacing of a galley floor to provide a waterproof and non-skid surface. The epoxy was mixed on the job with fine sand added as a filler. The mixture must be troweled on within a few minutes of the mixing. In application, general ventilation is supplied by portable blowers, an airline respirator is used in restricted areas, and gloves are used for skin protection.

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STUDIES ON AEROEMBOLISM, FATIGUE, AND VESTIBULAR DISORIENTATION

Here are three abstracts of studies of interest:

NAVAL AIR ENGINEERING CENTER, PHILA., PA. 19112
AEROSPACE CREW EQUIPMENT LABORATORY

1. Report NAEC-ACEL-529
2. Program Assignment No. 005-AE13-17
WEPTASK RAE 13C 005/2001/ R005 01 01

The Incidence of Aeroembolism Resulting from Rapid Decompression Following Exposure to a Mixed Gas Atmosphere at a Pressure of 380 mmHg; by CDR M. J. Damato, MSC, USN, LT G. L. Kellett, MC, USN, and CDR Kenneth R. Coburn, MSC, USN, 19 p., 1 Fig. 5 Tables, 10 Aug 1965.

To determine the decompression hazard associated with a mixed gas atmosphere, 12 subjects were decompressed to 35,000 feet on 100% oxygen following either (a) 3 hours of preoxygenation at sea level or (b) 12, 15, or 18 hours of equilibration at 18,000 feet in a 50% oxygen - 50% nitrogen atmosphere. The subjects engaged in light exercise while participating in 103 man-ascents under the conditions described above. An additional 19 man-ascents were conducted involving either standardization, increased exercise, or "sham" conditions. Test results indicate that breathing 100% oxygen at sea level for at least 3 hours or breathing a 50% oxygen-50% nitrogen gas mixture for 18 hours or more at an altitude equivalent of 18,000 feet will reduce the incidence of bends upon decompression to 35,000 feet. Approximately 10% of the exposures to the equilibration atmosphere resulted in bends which occurred at 18,000 feet (4 cases) and at 35,000 feet (1 case).

F/S Newsletter 10-65

Federal Aviation Agency, Office of Aviation Medicine, Civil Aeronautical Research Institute, Oklahoma City, Oklahoma. PILOT FATIGUE: INTERCONTINENTAL JET FLIGHT 1. Oklahoma City <———> Tokyo by G. T. Hauty, Ph.D., and T. Adams, Ph.D., March 1965, 22 pp. Report No. AM 65-16

I. Hauty, G. T.
II. Adams, T.

Following 3 consecutive days of biomedical assesament in Oklahoma City, six healthy subjects were transported to Tokyo, where assessments were made on alternate days throughout a period of 10 days, and were then transported back to Oklahoma City, where assessments were made for 3 consecutive days. Based upon the single parameter of rectal temperatures, the mean values of all subjects revealed that biological time had apparently shifted from Oklahoma City to Tokyo time within 3 days and from Tokyo back to Oklahoma City time within 1 day. Individual rectal temperature curves of the different subjects, however, revealed a profound range of individual differences. The mean proficiency with which the subjects executed basic task functions was adversely affected to a substantial extent during the first day in Tokyo and, to a lesser extent, the first day of return to Oklahoma City.

Descriptors
Fatigue (Physiology)
Pilots
Reaction (Psychology)
Medical Examination
Body Temperature
Physiology
Jet Planes

Federal Aviation Agency, Office of Aviation Medicine, Civil Aeromedical Research Institute, Oklahoma City, Okla. ADAPTATION TO VESTIBULAR DISORIENTATION: II. NYSTAGMUS AND VERTIGO FOLLOWING HIGH-VELOCITY ANGULAR ACCELERATIONS by William E. Collins, Ph.D. September 1965, 10 pp. Report No. AM-65-24.

Unclassified report

Unclassified
1. Collins, William E., Ph.D.

Professional figure skaters who, as part of their daily routine, subject themselves to high levels of disorientation— and vertigo-producing stimuli, were given a series of laboratory tests consisting primarily of caloric irrigations and mild angular accelerations. Electronystagmographic recordings and subjective reports (turning sensations and vertigo) were obtained. Contrary to other reports, brisk vestibular responses were obtained, prompting an "on-ice" study employing telemetry of eye movements to an ENG recorder and motion pictures. Data were obtained during and following normal high-velocity spins on ice. In the absence of opportunities for visual fixation, vigorous nystagmus and disorientation occurred. Thus, even with highly trained subjects, vestibular stimulation can produce disorientation when visual cues are not present.

Descriptors
Vestibular
Disorientation
Vertigo
Habituation
Visual fixation

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P3A CREW BECOMES ILL FROM STAPH POISONING

During a flight recently in a P3A, ten crewmembers became violently ill as a result of Staphylococcus food poisoning. The source was sliced turkey sandwiches rrom prepared box lunches. The pilot fortunately chose not to eat but the co-pilot was affected. Had the pilot also been poisoned it is fairly certain this incident would have had a tragic ending for Staphylococcal food poisoning is almost always completely incapacitating.

If Staphylococcus food poisoning is an unfamiliar term (and it probably is) you may recognize it as the "galloping jumps," "Chinese ying-yang fever," or "Montezuma's Revenge." As with the proverbial rose, by any other name it's still a bear.

Staphylococcus, the vicious little bug that caused this incident, is particularly active in hot summer months. It is the same bug that causes boils, carbuncles, pimples, etc. What usually happens is a food handler will infect the chow he's preparing. Mayonnaise, salad dressings, custard, pastries, sliced meats and meat products are the favorite vacation spas for the bug. The bug takes up residence in the food medium and quietly oozes Enterotoxin; it's poison. The food is then eaten and the consumer has 1 to 6 hours (usually 2 to 4 hours) to wait for an abrupt (and often violent) onset of severe nausea, cramps, vomiting, severe diarrhea and prostration.

The organism itself does not cause the harm. It's the nasty little toxin it exudes. In the above case, either the sliced turkey or the mayonnaise spread may have been infected. While it's not exactly practical for the Plane Commander to inspect the galley mess cooks for infections prior to each flight, there are some simple steps that can be taken.

(1) Avoid eating salad preparations, sandwich spreads and creamy pastries (chocolate eclairs are notorious) in flight during the summer months.

(2) Make sure your aircrewmember cook is free of skin infections and has hygenic habits.

(3) Do not eat the same meal as the co-pilot. (Instructions state this.)

(4) Space yours and your co-pilot's meals at least 60 minutes apart.

Most convalescents from this illness will say, "I was so sick I thought I was going to die and I sincerely hoped so." In an airplane their "sincere hopes" could easily become a reality.

-- Randolph TATE, LT, MC, USN
NAS Dispensary, NORVA

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PEARLS....

1. If anyone has a situation with dysbarism associated and an aviator, aircrewman, or passenger requires recompression, Dr. Richard W. Aiken has suggested that the Experimental Diving Lab in Washington be consulted when feasible in all cases.

2. Tri-Service medical injury reporting is in excellent shape now. We have just completed our 4th Joint Services Safety Meeting. The flight surgeons and ADP personnel (Automatic Data Processing) got together and just about finalized the form. It will be very similar to our present form but in some instances will be in more detail. One thing we will be able to do with ease with this new coding manual and form is to isolate and code in extreme detail as desired, any injury.

3. Big Request: Whenever an injury occurs due to the absence of flight gear or safety and survival equipment, please take the time to have the injury photographed and forward pictures to:

Aero-Medical Department Code 46
U. S. Naval Aviation Safety Center
U. S. Naval Air Station
Norfolk, Virginia 23511

Also, if an injury was modified because of the presence or absence of equipment again please photograph. With photos in both these categories, please enclose a narrative describing same. Thanks.

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ENCLOSURE 1

(This material appeared in the July 1965 RCAF Aeromedical Reports, Although Canadian survival equipment differs, these survival summaries may be useful in USN squadron lectures on land survival.)

NARRATIVE ACCOUNT OF SURVIVAL AND RESCUE EXPERIENCE OF NINE PERSONS WHO SPENT AT LEAST ONE NIGHT IN THE OPEN

Case 1, Oct 55, F86 Stn Chatham; overnight near Blackville, N. B.

The subject landed in bush on a cool night (43°F) about 2000 hours and was rescued about 1000 hours next day. He reported in the ejection questionnaire: "During the night the two flares were used to good advantage. The ring on the second flare broke on pulling it. The flap covering the top was torn off and the flare worked. The dinghy served as a bed with flaps pulled over for protection. Signals were made using heliograph mirror and safety match. The whistle was blown quite frequently. A fairly accurate bearing was obtained from compass on a train's whistle. The hatchet was used to clear the area for better visibility of the spread chute. A fire was attempted several times during the night with no success. Rations were not used until I was sighted and then one package was opened. Summer bush survival training had been attended. This training was beneficial. It helped psychologically. It gave me confidence in myself and I knew how to use the equipment available.

The primary factor in rescue was the VHF/ADF Emergency System. The secondary factors were signal flares and spread parachute.

Around daybreak I was spotted by an Expeditor - from then on aircraft never left me. The helicopter came over and circled but the trees were too high for a pick-up. I waited by the parachute until the ground search party came to me about 2-1/2 hours after being sighted."

The pilot recommended that pilots should carry two extra flares and matches in Mae West plus a knife and flashlight in the seat pack.

In a separate communication the pilot reported, "My feet felt cold so I opened the pack and the dinghy inflated revealing the survival kit. I felt around in the kit for some socks, found them and put them on. I was sitting around the parachute in the dinghy when an aeroplane was heard which came directly overhead. I immediately thought of flares and got two flares from the kit which I expended when the aircraft came overhead again. I did not have too many matches on me so I tried to conserve them although I had two extra packages in my pocket of safety matches brought from Survival at Edmonton. The aircraft kept coming back and forth and I attempted to signal them by using heliograph mirror holding a match

approximately four inches from the mirror. I tried to get a fire going three times during the night but failed due to the wood being so wet. The remainder of the night was spent blowing the whistle in the seat pack as voices were heard during the night. I alternately rested in the dinghy pulling the flaps over me to keep myself warm for the remainder of that period.

When dawn appeared I spread out my parachute, I cut down some trees to allow better visibility from the air and was in the process of building a fire when I was spotted from the air. At that time I ate some food from the rations and awaited rescue. Rescue was effected by a Ground Search party which arrived at approximately 10 o'clock."

Case 2. Nov 55, pilot, CF100 Stn Cold Lake; overnight 72 miles N.E. Cold Lake, Alta.

Light snow fell during the night in bush country. No report was made other than that his only difficulty was identifying equipment in the dark. He didn't use rations but did use the flare. He felt summer bush survival course gave understanding of procedures and of use of equipment. Only injuries were a cut and a bruise above the right knee....

Case 3. July 56, pilot, CF100 Stn Bagotville; overnight 8-1/2 miles W.N.W. Bagotville, Que.

Night overcast with very light rain showers in summer bush country. Case 3 landed uninjured; with his navigator (Case 4) used survival kit contents to set up a joint camp at about 2100 hrs. Items used were: axe, matches, clasp knife, mosquito net, flares, both liferaft and parachute for shelter (the CO_2 bottle only partially inflated the liferaft), and compass for trip out. Case 3 had had no survival training experience. The ground search party, who made use of the socks and rations from the seat pack, arrived at 2345 hours and waited till dawn for the trip out.

Case 4. July 56, navigator, CF100 Stn Bagotville; overnight 8-1/2 miles W.N.W. Bagotville, Que.

Case 4 suffered bruises on one thigh and had had both summer and winter bush survival training. Otherwise his account is identical to that of Case 3.

Case 5. Dec 56, pilot, CF100 Stn Bagotville; two nights, 35 miles south of Bagotville, Que., and

Case 6. Dec 56, navigator, CF100 Stn Bagotville; two nights, 35 miles south of Bagotville, Que.

Report to Flight Surgeon

Pilot's Experience: The first thing I remember was spinning around (no tumbling) with both feet out of stirrups. I got my left foot in okay but I had to use my hands to get the right leg back. I continued to spin clockwise in a vertical position until the large chute opened. I felt

practically nothing as an opening shock. I did not oscillate but had considerable drift as the wind was estimated at least 20 mph on ground. I went through the top of one tree and was hung up on the next one. My feet were approximately 15 to 20 inches above the ground when I stopped.

I first tried to recover the chute but I couldn't get it out of the tree. I then started from the top of the mountain on which I landed to the lake which I estimated as 1/2 mile away. It took 2 hours of heavy going and many rests to get there. On arriving at the lake I put together a rough lean-to of evergreen bough and went to sleep. I collected some fire wood before this but did not start a fire. Shortly after midnight I heard an aircraft so I got up and after spotting the aircraft I fired a flare. I wasn't sure I was spotted so I set off the red fuses with which I also started a fire. The aircraft started circling me and shortly after I went back to the sleeping bag as I was cold.

The next day, 11 December, I was very stiff and did not move around too much, but I did improve the shelter somewhat and got more firewood. I ate a little and melted snow to drink. That night I set another fire at 1700 hrs. and went to bed. This fire burned until after midnight.

I got up at 0700 hrs. on the 12th and as I was feeling much better than on the previous day I started to cut more bough. When the aircraft came back I fired another flare and a smoke generator. When the weather became bad again I got back in the sleeping bag to keep dry. After sleeping an hour or so I got up and began to look for fire wood when the Otter came into view and picked me up.

During my stay the weather was generally bad in snow, blowing snow and high winds.

Navigator's Experience

There was no trouble at all with the landing as I landed in the trees and was hung up about 3 ft. off the ground. I had trouble releasing my quick release box; it took about 2-3 minutes. After getting on the ground I tried to pull my parachute down but was unable to do so. I then tried climbing the tree and fell down about 20 ft. The branches broke my fall so I was not really hurt.

I then decided to cut down as much parachute as I could reach. I strapped the seat pack to my back and walked toward a lake I had seen while I was descending. It took about ten minutes to walk to the lake. Once I reached the lake I opened my seat pack to see what was available, then I began looking for a shelter location. I decided to cut down a tree about 3 ft. off the ground and then drape the parachute over the fallen part. I spread the ground sheet on the ground and put my sleeping bag on top of it. I shouted for the pilot a few times but there was no answer, so I went to sleep. I woke up about 1:30 in the morning to the sound of aircraft. I fired both night flares and there was no acknowledgement. I then set off my ten minute railroad fuse and got a greenflare and the aircraft turned on his landing light. I thought I had been spotted so

I went back to sleep as I had no more night flares. I woke up the next morning and it was snowing out. I didn't think the searchers would be around so I went about improving my shelter. I cut down a bit more parachute and also put in some spruce boughs on the ground. I then went out and cut a hole in the ice for water. I had a vitamin pill and a package of jelly beans and went to sleep at about 11:30 a.m. I kept waking up periodically by the high wind which had started. About two in the morning I woke up quite hungry, so I had a couple of jelly beans. At about 7:15 in the morning I was awakened by search aircraft so I went out and used my day flares but they may not have been quite close enough to see. I then waved my red bandolier. I went back into my sleeping bag at 9:45 when the search aircraft left. At about 12:45 I was awakened by what I thought was a helicopter and rushed out on the ice and was spotted. They made two passes to make sure and then landed on the ice and rescued me.

When I opened the seat pack I thought that there would be a rifle but there was none. The articles in the seat pack are all useful, especially sleeping bag and axe, and rations of course, and I would not like to see anything removed. All I used in the bandolier was the ground sheet.

There were no apparent injuries during my part of the incident.

Comment by the Flight Surgeon

Search aircraft were confident that they had spotted both crew members on the morning of 10 December. This being so there was not too much concern for their safety and it was hoped that at last the contents of the seat pack and bandolier would be put to the test under operational conditions. Unfortunately this was not so for two good reasons. In the first place both pilot and navigator were reasonably certain that they had been spotted on the first night and knowing they had ample food for at least a week were prepared to sit it out until rescued. Secondly the weather was particularly bad on the 11th - near blizzard conditions prevailing so that having made themselves comfortable the only sensible thing to do was to conserve energy and wait. Deep snow and the terrain made movement very difficult.

Both crew members had attended winter survival school. This they felt added much from the morale standpoint. The navigator's remark "I opened my seat pack to see what was available" is revealing. A display of seat pack contents is available at the unit Safety Equipment Section but is rarely visited by crews.

No injury was incurred by either pilot or navigator and both were passed fully fit after 24 hours observation in the station hospital.

Report by Case 5 in Ejection Questionnaire

Spent 43 hours in bush with intermittent snow and wind. Not eaten until search planes had spotted me (8 hours after bail-out) then two gum drops used - four gum drops and 1-1/2 biscuits eaten second day - three gum

drops and 1/2 biscuit eaten last day - 7 vitamin pills eaten. Spotted at approximately 0200 EST 11 December. Slept until 0800. Then I started a fire and improved shelter until snow storm hit when I went back to bed. I got up at approximately 0200 and the weather was still bad so I ate a little, collected firewood and went to bed at 0500. I slept till 0700, 12 December, at which time I got up and worked more on shelter and collected firewood until storm came back. I went back to bed until storm passed so as to keep dry. When storm passed I got up and shortly after the aircraft picked me up.

During the stay in the bush I ate 9 gum drops, 2 shortbreads, and 8 vitamin pills. I melted snow to drink. At no time was I really hungry or cold.

There was no game or tracks spotted. I used the bailout bottle to start one of the fires as generally the wood that was available was wet. It would have been convenient if there were some way to shut off the oxygen so that it could be used for more than one fire.

Generally I slept during the storms as it was impossible to get complete shelter from driving snow unless in the sleeping bag.

Survival Kit, Bandolier

Contents:

Knife, clasp	ea 1
Compass	ea 1
Snare, wire	ea 1
Fire tablets	ea 1
Whistles	ea 1
Mirrors, heliograph	ea 1
Fishing kit	ea 1
Food packet	ea 1
Match container	ea 1
Matches windflamer	ea 12
First Aid Kit	ea 1
CAP 361	ea 1
Socks, woolen	pr 1

CF100 Winter Seat Pack

Contents:

Sleeping bag	ea 1
Mitts, leather	ea 1
Mitts, woolen	ea 1
Food Packet AFFPI	ea 2
Socks, woolen	pr 2
Eye shields	ea 1
Match container	ea 1
Windflamer matches	ea 12
Day and night flares	ea 2
Safety Fuses	ea 1
File	ea 1
Axe, hand	ea 1

Report by Case 6 in Ejection Questionnaire

Spent 43 hours in bush with blizzard conditions after the first night. Used mitts, sleeping bag, axe, pyrotechnics and ration.

On the first night I heard the search planes around 1:00 in the morning and I rushed out and fired my flares, and the search aircraft gave me a green light. I then was quite certain that they had spotted me. Weather prevented searching the next day. On the following day at about 7:15 I again heard search planes but they never came nearer than about 1 mile of my location. At 12:45 I heard an Otter aircraft and ran out on the ice and was spotted. The Otter landed on the ice and picked me up.

Case 7. Jan 57. Captain, T33 Stn Vancouver (Aux); overnight 50 miles North of Vancouver, B. C.

The subject landed on a clear night (30°F) in winter bush; he suffered first and second degree burns to the dorsum surface of both hands. He had had no survival training. A knife carried in his flying suit was lost on descent. Although the axe handle broke with use he did manage to get a fire going. He ate part of the contents of one ration tin. Under recommendations, Case 7 suggested provision of flare projectiles which could rise above tree tops and inclusion of a flashlight amongst survival kit items.

Case 8. Jan 57, second pilot, T33 Stn Vancouver (Aux); overnight 50 miles North of Vancouver, B. C.

The subject landed some distance from his captain, Case 7, and apparently did not establish contact. Since his hands were severely burned (requiring skin grafting) he kicked the survival pack open. Although he was unable to open either the fire tablet container or the ration tins he did manage to light matches and operate the flares. He also used signal stripping. The dinghy served as a groundsheet.

Although he was first sighted at 2330 hrs. he was uncertain about the success of the contact and apparently remained very anxious about the outcome until he was reached by a para rescue team at 0900 hrs. next day.

Case 9. Sept 59, Navigator, CF100 Stn Bagotville; overnight 25 miles W.S.W. of Bagotville, Que.

The subject landed on a cloudy night (50°F) in dense bush with heavy rain falling for the first two hours. He suffered nose bleed on descent and a pulled ligament in the left shoulder. Case 9 who had had winter bush survival training reported in the ejection questionnaire, "Slightly after my landing at 1531 I heard an aircraft in the area, I climbed a tree and attempted to attract their attention by firing a day/night flare, but it did not operate properly and the aircraft did not see me. I then climbed another higher tree and spread my parachute on top of it. Within an hour I had a reasonable fire going and managed to put up enough smoke to be seen above the trees. I think I was sighted by CF100 603 at approximately 1700 hrs.

The land search party arrived at dusk (2000 hrs.) and we walked out to Lake Kenogami the following morning where the Sikorsky Helicopter picked me up and took me to Bagotville."

The pilot of the crashed aircraft parachuted into trees, made his way to a lake despite back injuries, and inflated the liferaft. Once out in the open he was sighted and rescued the first evening.

ENCLOSURE 2

BODY-BUILD AND SURVIVAL IN EJECTIONS FROM NAVY AIRCRAFT*

by

George T. Lodge, Ph.D.**

INTRODUCTION

Inspection of scattergrams showing the heights and weights of survivors, as compared with non-survivors, among pilots who had ejected from high-performance Navy aircraft has suggested that these variables were playing a definite role in determining an airman's prospects for survival. Moreover, these scattergrams have displayed a recognizable consistency from year to year. Yet, when height or weight distributions had been analyzed separately, no differentiation was evident between those who survived and those who did not.

Sheldon (6) developed a ratio obtained by dividing an individual's height in inches by the cube root of his weight in pounds. Since this proved to be a convenient device in studies of somatotypes and in other psycho-physiological research, we have employed it as the basis of the present enquiry. Figure 1 (for which I am indebted to the Douglas Aircraft Company (1)) clearly illustrates the extreme cases of body types here under discussion. The ectomorphic pilot on the left hand side of the drawing would have a very high ht / $\sqrt[3]{wt}$ ratio and would be classed in Decile X of the distribution shown in Table 1; while the endomorphic pilot on the right side would have a very low ratio placing him in Decile I. This cartoon also makes clear the fact that two individuals may be of exactly the same height and yet possess widely different somatotypes. The most common body type among Navy aviators is the athletic or mesomorphic type, which represents a sort of compromise between the two extremes illustrated in the drawing.

PROCEDURE AND RESULTS

Ht / $\sqrt[3]{wt}$ ratios were determined for all of the 1148 airmen who had ejected from Navy or Marine aircraft during calendar years 1955 through 1964. Of these 180 (15.68 percent) were fatally injured. Table 1 summarizes the results. In order to facilitate comparisons, the distribution of body-build ratios for the entire group has been divided into tenths, or deciles, each containing 115 ejectees (except Deciles V and X, each with 114).

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*Presented at the Seventy-Third Annual Convention of the American Psychological Association, Division of Military Psychology, Chicago, Illinois, 7 September 1965

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The span of ratios contained in each decile is shown at the left of Table 1. For the total group of 1148 ejectees, these ratios ranged from 11.72 to 14.06. The table shows the number of fatalities (numerators) along with the number of ejectees (denominators) in each decile for each year, as well as the totals for all rows and columns. It should be noted that the data contained in Table 1 become noticeably more consistent after 1957, which coincides with the introduction into general use of the current generation of escape systems. For example, of the 10-year total of seven fatalities in Decile IV, four occurred in 1956 alone. Nevertheless, the right-hand column of the table is concerned with the overall percentage of fatalities by deciles for the entire 10-year period. Since the overall average rate of unsuccessful ejections (i.e., fatalities) was 15.68 percent, we would expect, if one's body-build had no bearing on the outcome, that this same proportion would be approximated within each decile of the body-build distribution. Inspection of the column of percentages, however, reveals a range from the most favorable, 6.09% in Decile IV, to the most unfavorable, 23.68% in Decile X. In other words, the most ectomorphic tenth of all the ejectees suffered more than three times as many fatalities as the comparably-sized group which comprised Decile IV.

Decile IV is conspicuously freer from fatalities than any of the deciles on either side of it. As a result, and in spite of the fact that the function is non-linear, of these 180 fatalities, 59% occurred in the more ectomorphic half of the sample, and 41% in the more endomorphic half -- a difference significant at the .02 level.

Forty-five of the 180 fatalities were ascribed to drowning or loss at sea, one of the larger categories of mortality. In order that some of the implications of Table 1 can be more readily visualized, the heights and weights of the members of this representative group of non-survivors have been plotted in Figure 2. The corresponding somatotype deciles are defined by the diagonal bands crossing the chart. Deciles IV and V have been shaded to facilitate identification of areas of the scattergram. If these fatalities had been evenly distributed irrespective of body-build, then the expected quota in each decile would be 4.5. That only one fatality actually occurred in Decile IV and two in Decile V (instead of the expected nine) in itself is statistically unimpressive but, nevertheless, provides a graphic example of the point at issue. It should be noted that 31 of these drowning accidents have been plotted in Deciles VI thru X as compared with only 14 in Deciles I thru V ($P < .02$). Hood (4) observed that the endomorph group is made up of individuals who should be relatively buoyant and that this characteristic appears to be reflected in responses to personality test items: fear of water was reported much more commonly among his group of ectomorphs.

McFarland (5, p. 97) has commented that under certain cockpit emergencies, "the slight individual is at a marked disadvantage because the control forces that must be exerted are of considerable magnitude." This same observation may well be applied most literally to the data here under discussion: slight individuals would be comparatively handicapped, for example, not only in their efforts to overcome high-g conditions preparatory to the ejection, but also in contending with the physical stresses encountered after parachuting into the sea.

DISCUSSION

In recent years it has become customary in circles concerned with military aviation to lean heavily upon the concept of the Ninety-five Percentile Man. Any reference population from which the latter may have been derived often remains unidentified - as if this were an item of little importance! The Ninety-five Percentile Man is a creature who, in spite of being a purely mythical construct, has strongly influenced decisions behind military design specifications which, in turn, have influenced the production of hardware and equipment of every description whenever human factors were involved. The Ninety-five Percentile Man possesses the unique property of measuring 95 percentile with respect to whatever (first-order) anthropometric variable we may select.

For purposes of the present report, and drawing upon the most generally accepted set of standards available, namely, WADC Technical Report 52-321, Anthropometry of Flying Personnel-1950, it is sufficient to define The Ninety-five Percentile Man as one who is 73.1 inches tall and weighs 200.8 pounds. Similarly, The Fifty Percentile Man is 69.1 inches and 161.9 pounds; and The Five Percentile Man is 65.2 inches and 132.5 pounds.

From these values we obtain ht / $\sqrt[3]{wt}$ ratios of 12.5 for The Ninety-five Percentile Man, and 12.8 for The Five Percentile Man. These can be seen to straddle closely the boundaries of Decile IV as shown in Table 1. Similarly, if we plot the ratios of the whole series of matched height and weight percentiles for all values from the 5th to the 95th, we will observe that the resulting curve lies cleanly within that area of Figure 1 which is most free from fatalities due to drowning or loss at sea, namely the narrow band centered upon Decile IV. Comparable results also have been found with the scattergram (not shown here) for ejection fatalities attributed to causes other than drowning or loss at sea.

The conclusion is inescapable that one's chances for survival following ejection are enhanced if one's body-build conforms closely with that of the anthropometric manikins of Figure 3. On the other hand, nonconformists, whether in the direction of either endomorphy or ectomorphy are thereby handicapped to some extent in the case of emergency exits requiring use of existing escape systems. It appears to have been widely assumed that equipment built to accommodate the range of sizes from the 5th to the 95th percentile manikins will, thereby, appropriately accommodate the middle 90 percent of prospective flesh-and-blood operators of such equipment. The findings of the present report will suggest that perhaps we have been over-optimistic in this assumption. Altho, of course, no sharp boundaries are to be found between endomorphy, mesomorphy, and ectomorphy -- it becomes tragically evident upon looking at Figures 2 and 3 that, even if all the manikins are mesomorphs this definitely is not the case for all the pilots!

Any adequate effort to explain these data would look into a number of other relevant variables including, in each instance, the aircraft model involved; its altitude, attitude, and airspeed at the moment of ejection; the nature of the injuries received; and others. While such an inquiry constitutes an urgently needed field for research, it exceeds the scope of

the present report which was intended only to be a limited exploratory survey, It was felt that if we did nothing more, even, than to provide an initial formulation for a previously unidentified problem-area, we might be able to forestall to some degree its future aggravation. Pressures towards ever increasing machine standardization are always with us -- often at the expense of the human component in the given system. But appreciation of the reality of individual differences is a part of every psychologist's professional heritage, and we are obligated to point up this fact whenever we find it threatened with becoming subordinated to matters of hardware -- especially when survival itself is at stake.

SUMMARY AND CONCLUSION

1148 ejectees had ht / $\sqrt[3]{wt}$ ratios ranging from 11.72 to 14.06 with a median at 12.78. This distribution was divided into deciles and the proportions determined for each, of survivors to non-survivors. Fatalities ranged from a minimum of 6.1% in Decile IV to a maximum of 23.7% in Decile X. Pilots comprising Decile IV are of athletic build and have the most compatible proportions for cockpits designed according to standard height and weight tables. Decile X contains very slight individuals relatively maladapted to these cockpits, and who are more disadvantaged under circumstances demanding exceptional muscular strength. It was suggested that the prevailing practice of using 5, 50, 95, etc., percentile anthropometric manikins, all having nearly identical ht / $\sqrt[3]{wt}$ ratios, results in equipment which serves most effectively only a minority of the Marine and Navy pilot population. Need is demonstrated in the design specifications for escape systems for a further requirement that the equipment must be able to accommodate the full range of somatotypes possessed by those for whose use the products are intended.

Calendar Years

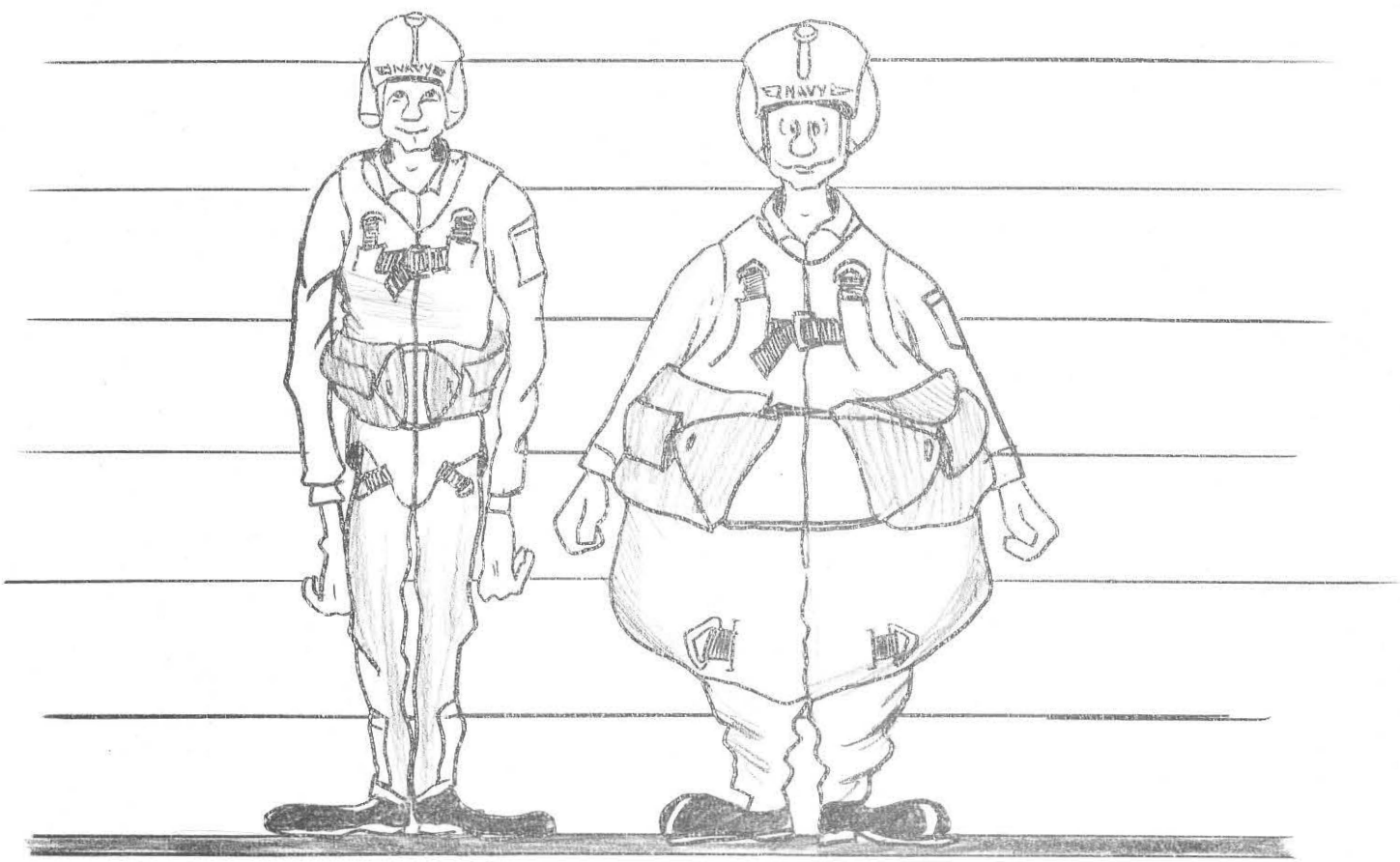
$H/\sqrt[3]{w}$	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	Total	%
11.72 - 12.32	0/5	0/7	2/11	2/12	2/18	1/14	5/13	0/11	1/9	2/15	15/115	13.04
12.33 - 12.45	2/7	4/8	2/8	2/17	1/16	1/12	3/14	0/11	1/12	1/10	17/115	14.78
12.46 - 12.56	1/10	4/12	1/6	4/17	2/16	0/9	4/13	0/4	2/14	1/14	19/115	16.52
12.57 - 12.69	0/0	4/7	1/18	0/14	0/17	0/6	0/17	0/9	0/11	2/16	7/115	6.09
12.69 - 12.78	1/3	1/13	3/10	0/7	2/9	2/10	2/15	2/20	2/13	1/14	16/114	14.04
12.78 - 12.87	0/10	2/12	2/15	1/14	0/10	2/8	2/12	2/10	4/11	3/13	18/115	15.65
12.87 - 12.99	0/5	4/9	6/18	4/23	1/6	0/8	4/13	1/7	1/9	3/17	24/115	20.87
13.00 - 13.13	3/10	1/9	0/12	2/11	1/13	2/9	2/14	2/19	0/9	1/9	14/115	12.17
13.13 - 13.33	2/7	1/8	3/13	5/14	1/9	2/16	2/8	1/10	4/20	2/10	23/115	20.00
13.33 - 14.06	4/10	2/9	2/14	2/14	2/9	4/17	2/10	3/10	3/10	3/11	27/114	23.68
	13/67	23/94	22/125	22/143	12/123	14/109	26/129	11/111	18/118	19/129	180/1148	15.68

Table 1

Proportions of fatalities among ejectees according to somatotype

Enclosure (2) to
FSNL 10-65

FIGURE 1

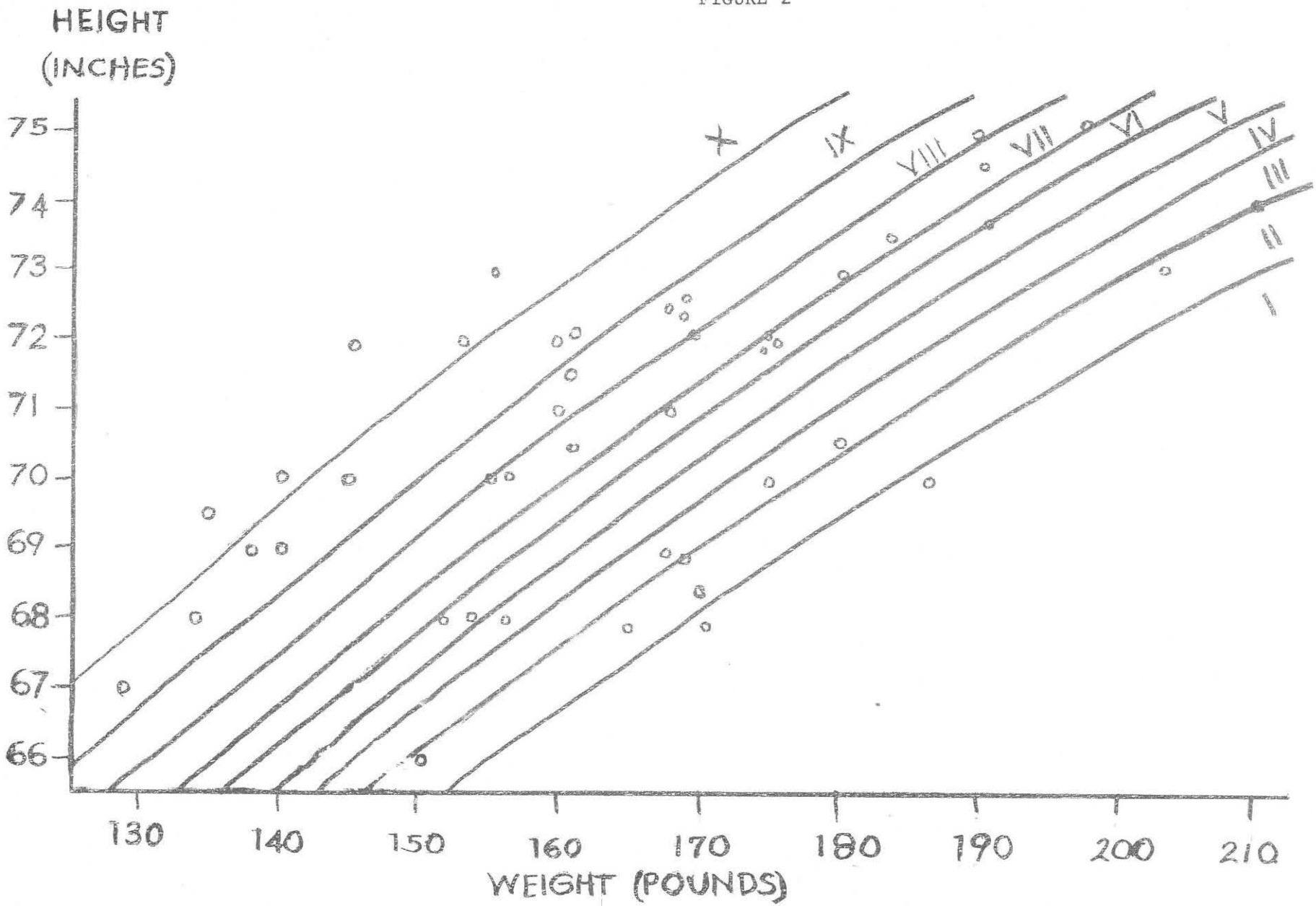


Ectomorph Endomorph

Courtesy of
Douglas Aircraft Corp.

Enclosure (2) to
FSNL 10-65

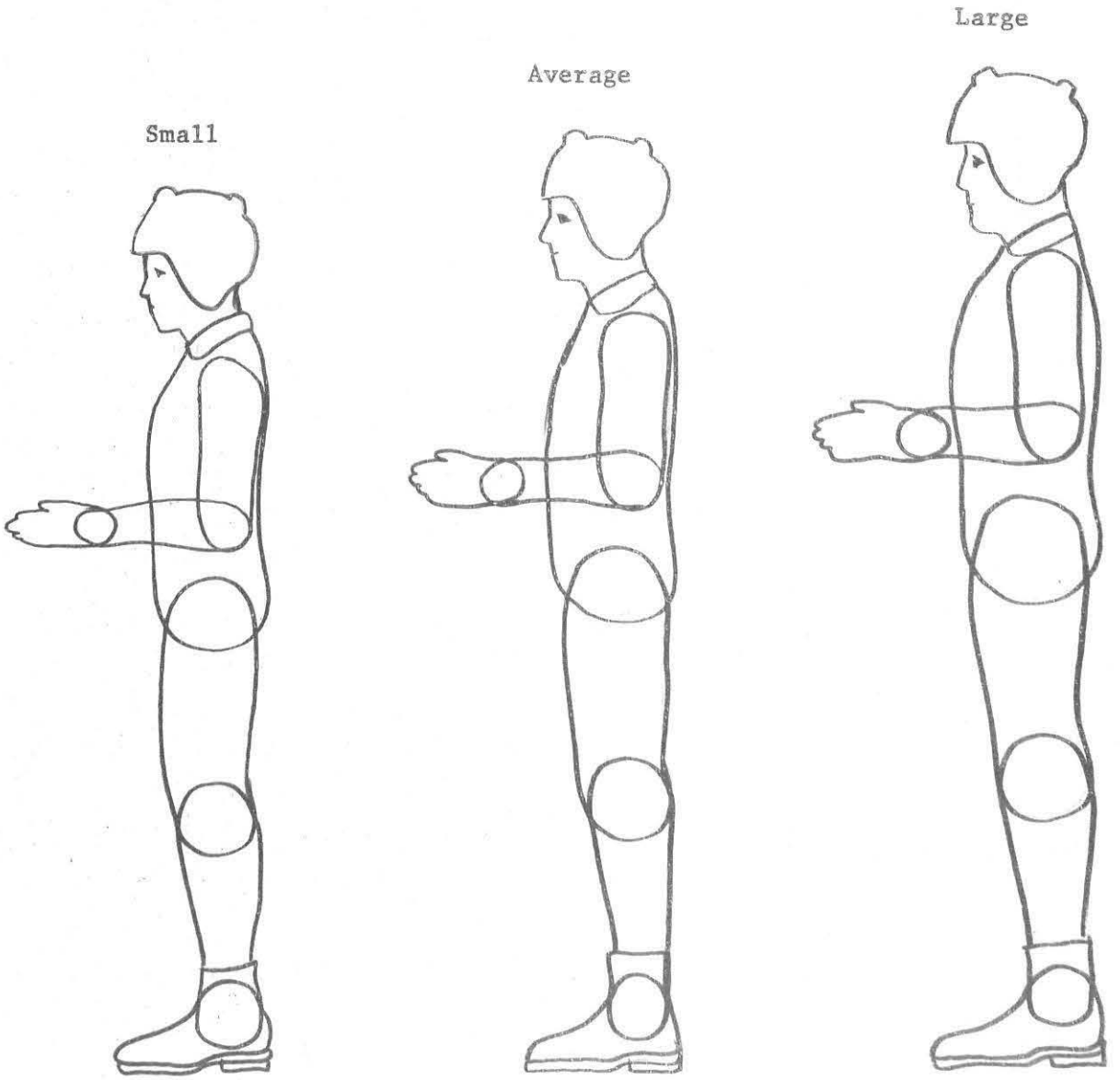
FIGURE 2



Heights and weights of non-survivors from ejections: deaths due to drowning or loss at sea. N=45 (1955-1964). The decile boundaries of the ht/ $\sqrt[3]{wt}$ ratios (diagonal lines) were derived from a representative sample of 1190 Navy pilots from operating squadrons.

Enclosure (2) to
FSNL 10-65

FIGURE 3



Enclosure (2) to
FSNL 10-65

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* *

This paper represents an exploratory survey prepared as part of the U. S. Naval Aviation Safety Center's Human Error Research and Analysis Program (HERAP). Acknowledgement is made to Mrs. Evelyn Willoughby, Statistical Assistant, for assistance in assembling and organizing this material.

Flight Surgeon's NEWSLETTER

(This material is for the information of Navy flight surgeons only and does not necessarily reflect endorsement by the Navy or the Naval Aviation Safety Center.)

ENCEPHALOPATHY DUE TO CEREBRAL ANOXIA

Shortly after a TA-3B leveled at assigned flight level 290 on a scheduled logistics flight, the right hand forward canopy enclosure panel adjacent to the co-pilot failed and blew out with resultant explosive decompression of the cockpit and cabin spaces. The co-pilot was subjected to the full blast of exhausting air. His head was jerked forcibly into the slipstream and he was instantly rendered unconscious, being held partially in the slipstream by wind blast upon his helmet. He was restrained in his seat by the torso harness attachments.

The pilot immediately began an emergency descent and notified base of the emergency. The third crewman attempted to pull the co-pilot clear of the slipstream but was unsuccessful until he cut the chinstrap of the co-pilot's helmet, jettisoning the helmet. To facilitate the third crewman's efforts the pilot slowed the aircraft, using a wing-over type maneuver. Oxygen was administered to the co-pilot while an emergency landing was made at a naval air station. A doctor and medical crew met the aircraft and the co-pilot was taken to a naval hospital for treatment. (None of the other crewmembers was injured.)

Here is part of the investigating flight surgeon's report from the MOR:

"The co-pilot was entirely limp and breathing well until the aircraft taxied to a stop when he began uncontrolled, thrashing movements with his arms and legs.
The doctor at the scene elected to restrain him in his seat and to continue to administer the aircraft's oxygen for about 10 minutes. He was then transferred by ambulance to(a naval hospital). While being placed on the stretcher, he showed first evidence of generalized, mild tonic, clonic movements. At no time did he speak or show signs of consciousness."

The co-pilot's injuries were:

"1) Narrow linear abrasion extending from just behind each ear and running behind and high under the jaw. This was caused by the chin strap which was fully extended and pulled tightly against the neck of the helmet which was in the windstream and off the pilot's head. There was evidence of a to-and-fro motion as well as tension.

"2) Corneal abrasion, OD, with minor soft tissue trauma of the periorbital tissue. Fully healed and vision normal (22 days later). Specific cause is unknown.

"3) Bruises and abrasions of both deltoid and shoulder regions and of the dorsum of the right hand. These were caused by a combination of forces on the body against the seat and shoulder harness in addition to the thrashing about the cockpit later as he was removed at (the naval air station)."

The conclusions and recommendation from the MOR are as follows:

CONCLUSIONS

"1. No illness or condition was present in (the co-pilot) to aggravate the unexpected stress of decompression or subsequent cerebral hypoxia.

"2. Had the chin strap been tight, the helmet would not have separated to the point of producing such drag/strangulation forces as it did.

"3. Had the co-pilot not been strapped in his seat, he would have been lost from the aircraft. The shoulder harness take-up reel was probably unlocked; however, it is possible with the extreme forces at work, that the head could have been placed through the opening as it was by obliteration of all slack in the harness and torso harness.

"4. The snapping of the helmet off (the co-pilot's) head caused an immediate sharp blow to the neck structures which may have caused immediate reflex cardiac arrest. Sudden occlusion of the carotid vessels or of the airway is not likely to cause such sudden unconsciousness as was observed, with the vertebral-basilar circulation intact. Also the neck abrasion is high under the angle of both jaws running up behind the ears. This is not optimum for occlusion of the carotids; however, the force being exerted was no doubt extreme.

"5. Despite the prolonged signs and symptoms of cerebral hypoxia that (the co-pilot) has fully recovered with no evidence of any residual damage.

RECOMMENDATION

"This incident recommends itself as a practical reminder for all to adhere to standard operating procedures in this or any aircraft, specifically in this instance, regarding wearing of flight gear and being strapped-in. As this incident demonstrates, an emergency situation may develop before life-saving action can even be contemplated."

Here are the findings of the Medical Board regarding the encephalopathy due to cerebral anoxia:

"This 37 year old CDR, who has served on active duty for approximately 17 years, was admitted to the Sick List as a direct admission at U. S. Naval Hospital, . . . on (I Day)*,

* I Day - day of the incident

with the diagnosis of encephalopathy due to cerebral anoxia, following a high altitude decompression phenomenon when the canopy of a TA-3B twin engine jet trainer, at 29,000 feet altitude, exploded and he, as co-pilot, was pulled into the opening into the canopy, experiencing a strangle constriction of his neck, when his helmet was placed on stretch. He was released from this position in a state of unconsciousness. The plane was immediately landed at USNAS... and the patient transported to the hospital via ambulance.

"On admission here, the patient, although unconscious, required restraints to control his extreme psychomotor activity with thrashing of all extremities and pronounced grimacing of his facial musculature. The neurological examination revealed his cranial nerves to be intact, with the exception of a dilated right pupil. There was an abrasion on the right corneal surface. With the exception of extreme hyperactivity, the motor system was within normal limits. The reflexes were hyperactive, but there were no pathological reflexes. All sensory stimuli merely provoked the hyperactivity. There was no evidence of cerebellar dysfunction. With the exception of the abrasion of the right cornea, the only physical evidence of injury was a congested delineated encirclement, edematous and elevated, about the upper neck. X-rays of the skull were reported negative. Electroencephalographic examination was mildly generalized abnormal, with no indication of focal predominance. His vital signs were excellent. X-rays of the chest and entire spine were reported as negative.

Hypothermia to 32 to 33 degrees C. was initiated on the patient, and he was immediately placed on intramuscular sodium Dilantin, 100 mg. to be repeated 3 times daily, to prevent convulsions. Throughout the night of the day of admission, the patient's agitation rapidly subsided and by the following morning he was able to control his muscular system, comprehending and communicating. He rapidly became well-oriented in all spheres and, with the exception of the complaint of minimal headache, and blurring of vision in the right eye, was relatively symptom-free. He was maintained on sodium Dilantin, 100 mg, twice daily, until (I + 4), at which time it was reduced to one capsule per day, and this was discontinued after 24 hours. On (I + 2) he was ambulatory about the ward and on (I + 9) he was ambulatory in uniform on liberty. Repeat electroencephalogram on (I + 11) was reported within the range of normal variation. An electrocardiogram was also reported normal. Ophthalmological evaluation had revealed the corneal laceration and a notation of (I + 3) is as follows: 'The abrasion of the right eye has almost completely re-epithelialized. There is a small, bare area superiorly. The pupil continues to be dilated with a cycloplegic.' On the following day,... (I + 4) it was noted that the 'cornea now covered with new epithelium.' On (I + 9) the visual acuity of the right eye was reported as 20/40 and 'the eye much improved with less injection.' Visual acuity of the left eye remained 20/20. On (I + 11) it was noted that the right eye appeared normal, 'except for superficial stromal changes in the central corneal area.' All drops were discontinued, with the exception of Neo-Sporin. The patient was advised to wear a shield over the right eye when sleeping. It was also the Ophthalmologist's direction for the patient to return as an outpatient in two weeks....

"Relative to the accident, the patient states that he was a co-pilot in a TA-3B twin engine jet trainer, and his last memory was related to 'making a report at 23,000 feet altitude over the radio about 40 miles south of Jacksonville.' He states that he 'came to' the morning following his admission to the Sick List at U. S. Naval Hospital... when 'I was aware I was restrained in a bed.' He stated that this is the only time that he has experienced loss of consciousness.

"Following a period of observation, the diagnosis was retained as: Encephalopathy due to Cerebral Anoxia, #7818, moderately severe, entirely recovered; and Abrasion, Right Cornea....

"Discharged to duty (I + 12)."

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FISH POISONING

An episode of fish poisoning reported to members of this Unit who were recently in the Caribbean area points up the urgency for Medical Department personnel to warn all "fantail fishermen," recreational skin divers, personnel undergoing survival training, etc., that violent sickness and even death may result from eating certain species of fish.

The intoxication resulting from the ingestion of the flesh of poisonous fish has been named "ichthyosarcotoxism" (from the Greek ichthyos, "a fish;" sarkos, "flesh;" toxikon, "poison") by one of the foremost students of fish poisoning, Dr. Bruce W. Halstead. Dr. Halstead has completed a survey of nearly fifteen hundred publications on the subject of poisonous and venomous marine animals from all parts of the world, and found that during the last 200 years almost 518 species of fish involving 95 families have been incriminated as poisonous. Thirty-eight of these were of commercial importance.

Some fish are inherently poisonous at all times, while others develop physiological poisons only at certain times or places. Most of the fish which are constantly poisonous belong to the family commonly known as globe fish or puffers (Tetrodontidae). Other fish, such as parrot fish, jacks, trigger fish, king fish, barracuda, snapper, and sharks, are reported to be poisonous during certain seasons and at certain places in the tropics. The toxic substances are usually associated with the reproductive organs, the ovaries and eggs, but the poisons may also be found in the head, liver, or flesh. The roe of certain species is poisonous during the spawning season. These toxic substances are not destroyed by cooking.

The symptoms of such poisoning are more or less similar to other types of food poisoning. Death may follow after varying periods of illness. The first symptoms are usually a loss of taste, a scratchy sensation in the mouth and throat, epigastric pain, numbness in limbs, tingling around the mouth and face, and giddiness. Respiratory complications usually develop in some cases. No known antidote for the poisoning has been found and treatment is symptomatic.

Native people have numerous methods by which they attempt to distinguish a poisonous fish from an edible one. The significance of silver coins changing colors, color of the fish, condition of the gills, the position of the scales, ad infinitum, is generally based on local superstition rather than on scientific fact. One cannot detect a poisonous fish by its appearance. Moreover, there is no known simple chemical test to determine edibility. Unless you know the edibility of species of fish being caught in your area, which may be determined by consulting local health officials, it is strongly recommended that no locally caught fish be prepared in messes for general consumption, nor as a favor for a crew member who got lucky on the fantail.

---Health Notes
U. S. Navy Preventive Medicine Unit No. 2

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LET'S KEEP IN CONTACT: NEWS FROM NAVAL AIR BASIC TRAINING COMMAND

The following comes from CAPT P. S. KWIATKOWSKI, Staff Medical Officer, Headquarters, Naval Air Basic Training Command, Pensacola:

LT George M. STONE, MC, USN, Class 106, is now stationed at Naval Air Station, Pensacola, Florida, as assistant medical officer. He has been accepted for an OB-GYN residency at Portsmouth, Virginia, starting in July 1966.

NAS Pensacola also has a new flight surgeon from Class 107, LT Richard DEMPSEY, MC, USN, who is assigned to the Search and Rescue Unit at Sherman Field. He and his wife, Jan, recently had a baby boy, their first child.

LT Jerry THOMAS, MC, USN, Class 106, is presently attached to VT-4 with additional duty at N.A.O. School at Sherman Field. He recently returned from a six-week tour of Europe with the Blue Angels.

Squadron VT-1 at Saufley Field, Pensacola, has LT Asa GODBEY, MC, USN, as their flight surgeon from Class 105. A few months ago, he and his wife, Karolyn, were presented with a baby boy, their second.

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ALCOHOL IN AVIATION ACCIDENTS

The following excerpt from an item titled "Human Factors in a Fatal Aircraft Accident" by S/L W. J. C. Stevenson, C. D., Flight Surgeon, RCAF, which appeared in the U. S. Navy Medical News Letter, Vol. 46, No. 8, is being reprinted here just in case you missed it:

"Regional Flight Surgeon's Comments:

"Recently there has been considerable publicity given to aircraft accidents associated with alcoholic impairment. Unfortunately there is very little information on the hangover and its relation to aircrew performance. It is of interest to note that Harper and Albers[2] state that in a study of 158 civilian aviation accidents in 1963, in which toxological examinations were performed on the pilots involved, 56 were positive for blood and/or tissue alcohol (alcohol levels over 15 mgm/100 ml), but that flying skills are measurably decreased by one-fourth this amount.

"The problem of staging when an individual may fly following consumption of alcohol and the difficulty of enforcing any rigid limitations or regulations are obvious. It is equally obvious that the '8-hour rule' takes no consideration of the late night, lack of food, and the hangover. Franks[1] referring to alcoholic hangover, states that RCAF regulations take no cognizance of the post-alcohol change which can be equally as dangerous as being under pharmacological influence of alcohol. Strickland[4] states that there is general unanimity of opinion that if an individual has consumed 4 oz. of whiskey or the equivalent, a period of at least 18 hours and probably 24 hours should elapse before flying.

"As education and understanding of the action and effects of alcohol appears to be the most acceptable solution for prevention of accidents as described, Unit Flight Surgeons are urged to continue to stress the dangers of flying following over indulgence, etc. Excellent articles on this subject appear in McFarland's Human Factors in Air Transportation[3] and in the previously mentioned references.--Aeromedical Reports 1965."

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POSTMORTEM BIOCHEMICAL CHANGES

Interpretation of certain postmortem biochemical tests must be approached with caution. Unless blood and other body fluids are obtained within several hours after death, the validity of many quantitative determinations is open to question. For example, NPN, pH, ammonia, potassium, chlorides and sugar represent some of the things in body fluids which are known to change significantly after death. The degree of change is subject to a number of variables so the use of "fudge factors" in assessment of results is rather unsatisfactory. Influences which must be considered include temperature, mode of death, length of agonal period and physical condition and exposure to extreme stress prior to death. So don't be misled if you encounter a situation where the biochemistry looks way out of line -- remember that postmortem enzymatic activity goes on for some time after "legal" death. Carefully consider the time after death the specimen was obtained plus other attendant factors before jumping to a conclusion.

The opposite side of the coin is remembering there are things which remain relatively unchanged postmortem. Carboxyhemoglobin, many drugs and toxic substances and alcohol represent examples of substances which may stay at a stable level for a long period after death. As a last thought -- in all cases avoid specimen contamination to minimize escalating your little headache into a big one.

----Walt Gable, CDR, MC, USN
Aviation Pathologist

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PEARLS....

1. A very important contribution that all flight surgeons can make to the effort of accident prevention is accurate accident investigation. Each day we spend right at $1,000,000, on the average, due to loss of naval hardware. This cost of accidents is making naval aviation itself almost prohibitive. We are literally about to fly ourselves out of business.

We have explored the machine, selection of aviators, and their training... the weather... acts of God... and are about to take a long hard look at the man -- to compare the accident pilot and the non-accident pilot, their relationship together and to their similar environment. An answer to some of the etiologies of naval aviation accidents must lie here but most certainly not all. You do care about saving lives since you are physicians so rest easy in knowing there has been a steady decrease in fatalities but, Doctors, we have a further obligation to our national economy. In this you must also lend a hand. To prevent an accident is often not only to save a life but also many millions of dollars.

Here at NASC we have received MORs in which it is obvious that the flight surgeon has not made the scene of the crash nor the autopsy or has taken so little time in filling out the MOR that statistically and factually the report is of little or no value. We encourage you to submit toxicological reports on all incidents and accidents. No command, including NASC, is out to take a set of wings away from any one aviator, but, gentlemen, no stone can be left unturned in the search for the preventable causes of aviation accidents.

Encourage physical fitness, rest and relaxation when indicated. Stress normal hours for work and play. Explain what alcohol and late hours do -- even to the professionals. Watch closely people you put on diets.

Generally most of you do outstanding jobs, but if the naval aviator's job is never done, how can ours be?

---- Nic Broussard, LT, MC, USN

2. Elsewhere in this issue of the FSNL you will find "Let's Keep in Contact" news from the Naval Air Basic Training Command, Pensacola. We would be happy to hear from any of you who will take a minute to send us news items and/or contributions to the FSNL.

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Flight Surgeon's NEWSLETTER

(This material is for the information of Navy flight surgeons only and does not necessarily reflect endorsement by the Navy or the Naval Aviation Safety Center.)

TREATMENT OF HEAT STROKE ABOARD SHIP

During operations in the Western Pacific a case of hyperpyrexia (heat stroke) occurred aboard CVS-12. Here is a description of the case by LCDR M. J. DUNNE, MC, USN:

"The 17-year-old subject suddenly felt weak, nauseated, dizzy, with hot dry skin and flushed appearance. In a few seconds he collapsed but was highly agitated requiring manual restraint. Rectal temperature was recorded shortly afterwards at 107° F. The patient was placed in a human remains bag and packed in ice (no baths aboard ship) until his temperature dropped to 96° F. rectal. No sedatives or other medications were given. Normal saline intravenous drip was started at less than 10 drops per minute. The patient became semi-comatose with fixed dilated pupils bilaterally, absent peripheral reflexes and no reaction to painful stimuli shortly after reaching 96° F. rectal temperature. He was placed in a cool, well-ventilated room with an electric fan. In less than three hours, the patient returned to practically normal state except for slight confusion and slow reaction to questions or stimuli. He was referred to Subic Bay Naval Hospital for renal and hepatic studies.

"Comment: Hyperpyrexia has a mortality of approximately 20% over all ages, the highest mortality occurring in persons over 40 years of age with systemic disease. At 108° F. irreversible changes occur in the brain. A temperature of 106° F. is a grim prognostic sign but with prompt proper treatment, all may be well. It is important to give no sedative during excitement stage prior to hypothermia and more important not to give stimulants when semi-comatose stage occurs with hypothermus. A normal saline infusion may be started but slowly to avoid pulmonary edema and to be prepared for hypotension in hypothermic stage of treatment. Constant observation by a medical officer is mandatory until pyrexia and hypothermia are no longer present. If the patient's temperature rises above 99° F. following initial hypothermia treatment (to 96° F. only), repeat hypothermic treatment. Oxygen, epinepherine, digitalis, sedatives and other supportive measures may be required but in young healthy patients will usually be unnecessary.

"Since the most rapid return to normal temperature is desired and as ice in large quantities as well as a body bag or some similar equipment to hold ice water with the patient may not be available aboard all ships, it is suggested that all patients suspected of hyperpyrexia should be placed in the ship's reefer under a medical officer's supervision until a temperature of 96° F. rectal is reached. Then the patient should be moved to the

"veg room reefer" until he becomes conscious. This simple procedure can save untold messing and excitement as well as bring the patient's temperature down in the shortest possible time.

"Two additional cases were subsequently treated by stripping them naked and laying them on the reefer deck. Steam from the perspiring patient rose for over 10 minutes after which he calmed down and began to complain of the cold. The patient was given liquids plus ice cream sherbet and bed rest and was perfectly normal within one hour but was given the rest of the watch off."

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"IT CAN'T HAPPEN TO ME!"

Those of you who believe this have already stopped reading, so perhaps I should stop writing. In the hope that you will continue and read on, however, let's pursue the matter a bit further.

Nobody tempts fate by saying that it can't happen to him. That many of us feel this way, however, is amply demonstrated by the foolish chances that we take from time to time. Some of you might feel that this "risk-taking" is a manifestation of death wishes. It is just possible, however, that at least two other reasons for taking risks are responsible for such behavior a great majority of the time. The first is demonstrated by the intelligent and careful person who, after taking all possible precautions to diminish the hazards, accepts a certain risk of bodily harm in order to achieve a goal felt to be worth the risk. It matters not whether the reward is fame or fortune. The fact that he can collect no reward if he is killed is evidence that he must really feel that he won't be killed. A second reason for taking risks is a failure to recognize the true risk involved. There are, of course, other reasons -- there are undoubtedly those real heroes who knowingly give their lives that others may live and those others who are really seeking death. The great majority of the accidents and fatalities reported to this office, however, involve people who failed to recognize a dangerous situation or believed it could not happen to them.

We must be very careful in any discussion of this subject to point out that we could never have an effective fighting force if the large majority of the people involved did not feel that "it couldn't happen" to them. In discussions with aircrews, it is important not to destroy this confidence factor that is so necessary. We must attempt to draw a rather fragile and ill-defined line to separate the confidence necessary for combat and the foolishness that saps our fighting strength by needless accidents. In your day-to-day contact with aircrews, it is absolutely essential that you point out the unnecessary risks without bringing undue attention to the unavoidable hazards of flying.

The practical approach to this problem is perhaps best illustrated by a few examples. It is necessary that the crew climb aboard a jet bomber and fly it. In so doing, they must accept the risk of death in certain types of accidents. To minimize the danger, however, careful pre-flight inspections are made. Check lists are used to avoid overlooking an essential step in preparing for flight. Traffic control personnel direct it to the safest route. Weathermen give their best estimate of enroute weather. Personal equipment technicians and supply personnel give them the best available protective equipment. In spite of all this, the crew bails out and two men die of exposure. These men undoubtedly felt this could not happen to them. Did this attitude cause them to fail to bring along all of the proper equipment or not to listen to the briefings and training lectures?

What of the man who leaves his ejection seat to perform necessary tasks? Returning to his seat, he does not fasten his seat belt, because certainly his plane will not hit clear air turbulence and go out of control. This couldn't happen to him! You guessed it, he was still in the plane at ground impact, although everyone else ejected. Consider the young tiger who leaves his helmet at home because, after all, it's only a short ride in a light plane. He couldn't possibly have a crash landing and hit his head on anything in the cockpit. We'll never be absolutely certain whether or not he would have survived with a helmet. His buddy didn't fasten his shoulder harness. We will likewise never know if a snug shoulder harness would have prevented the fracture-dislocation of his spine and transected aorta. How often have you been briefed that you won't need a life preserver or life raft because you'll only be over water a short time as you take-off over the bay? Do you know how many engines fail shortly after take-off?

There are many more examples. The point is that we must encourage discipline and training to make certain that the crews are ready for the situation that can't happen to them. This is accomplished only by persistent monitoring of the equipment, training, and mental preparedness of your pilots.

--- U. S. Air Force Safety Officer's Kit

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DISPOSITION OF PARACHUTES

The following excerpt from the Parachute Manual (NavWeps 13-5-501), Section I, paragraphs 1-38 and 1-39, Disposition of Parachutes and Actuators After Emergency Usage, is quoted for information:

1-38: "Parachutes and acutators which have been received following emergency bailout or ejection shall be removed from stock and turned into the nearest supply activity on an exchange basis. The turned in parachute shall be shipped to the Commanding Officer, Naval Aerospace Recovery Facility, El Centro, alifornia, marked 'For Naval Aerospace Recovery Facility Evaluation and Testing.'" (Compliance with this instruction is mandatory. -- Ed.)

1-39: "To provide the Naval Parachute Facility (now the Naval Aerospace Recovery Facility) with sufficient information to properly evaluate and improve these parachutes for service use, a brief summary of the ejection or bailout shall be enclosed with each parachute turned in after emergency use. This summary shall contain the following information:

a. Activity.
b. Date, time and place of the emergency escape.
c. Serial number of parachute assembly and automatic actuator.
d. The name, rank or rate of the involved personnel.
e. Type of aircraft, the altitude and airspeed if known.
f. Was the emergency exit successful in all respects? If not, list the difficulties encountered.
g. Did the parachute and automatic actuator function properly?
h. Remarks or additional information as deemed appropriate."

--- Personal/Survival Equipment Crossfeed 10-65

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PEARLS....

. We plan to start a new section of the Flight Surgeon's Newsletter, namely "Questions and Answers."

In this section we will attempt to answer any and all pertinent questions submitted by flight surgeons. Oftentimes an answer to a question from the fleet would be of tremendous interest to all flight surgeons. We hope not only to include answers as such when we can, but also give all concerned a chance to benefit from questions submitted.

. Notice the informative article in this issued by Mike DUNNE, Senior Medical Officer on CVS-12. This kind of information is great for the Flight Surgeon's Newsletter. How about some other contributions -- medical or otherwise?

. It's been brought to our attention that an error has been committed by well-meaning flight surgeons. This has to do with care of aviators during an illness but also includes post-illness care or follow up after hospitalization. A very important factor in making sure that this aviator and his buddies come to you when they are ill is a good "follow up." If an aviator is hospitalized and needs a medical board of some type do not throw him to the wind. When he's away from you other doctors have a tendency to be less concerned over his aviation future. Flying is all this aviator knows. It is unfortunate for any career Naval officer to need medical boards and retirement, but if such is the case, then so be it. Take a look around when this occurs because the remaining nearby aviators are observing every move you make. Poor handling or suspected minimal neglect on your part could cost you your entire reason for being where you are -- stay with 'em.

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ENCLOSURE 1

SUBJECT INDEX FOR JANUARY - DECEMBER 1965 FLIGHT SURGEON'S NEWSLETTER

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